ATHABASCA UNIVERSITY

THE LIVED EXPERIENCE OF GEOGRAPHICALLY SEPARATED HEALTHCARE STUDENTS PRACTICING INTERPROFESSIONAL TEAMWORK IN A SYNCHRONOUS VIRTUAL WORLD SIMULATION

BY

NORBERT WERNER

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Submitted by

Norbert Werner

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The thesis examination committee certifies that the thesis
and the oral examination is approved

Supervisor:

Dr. Marti Cleveland-Innes
Athabasca University

Committee members:

Dr. Mohamed Ally
Athabasca University

Dr. Kathleen Matheos
University of Manitoba

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Dedication

I first and foremost dedicate this effort to my family. Debbie, you have been incredibly patient and supportive as a spouse and have always been willing to "carry the load" at home when studying or writing was required of me. Grace, Jonathan, Sara, and James…you are wonderful children who have also been patient in allowing me to complete this work and always quick to offer an encouraging word, helping me to press on and persevere through this journey of learning. Thanks for keeping the volume a bit lower than usual on movie nights at home so that I could concentrate when reading, reflecting, studying, or writing this thesis. Thanks for allowing me to be slightly distracted at times and occasionally fully consumed with completing this thesis, sometimes at the expense of not spending time with you or not always being the best listener.

My thesis committee….thank you for your guidance and feedback throughout the completion of this research study. I thoroughly enjoyed my oral exam with you and appreciated the affirming words and suggestions for further growth.

I finally dedicate this study to the distance learning healthcare student who would not normally have an opportunity to experience interprofessional teamwork prior to graduation because of geographical separation from other healthcare students. May this study and the use of synchronous virtual world simulations offer a new and exciting opportunity for your development of these teamwork skills and further enhance your delivery of safe, patient-centered care.

Abstract

3-D virtual world (VW) simulations are one example of an emerging technology in healthcare education where distance or blended learning students can participate together and practice the necessary teamwork skills that they require for the real world prior to graduation. The purpose of this transcendental phenomenological study was to describe the essence and meaning of the lived experiences of geographically separated healthcare students from two post-secondary institutions when exposed to the instructional strategy of a synchronous VW simulation for the purpose of learning and practicing IP teamwork. Not understanding the overall experience of primary stakeholders such as the students themselves with the use of VW simulations for the purpose of practicing IP teamwork may result in poor uptake and negative learning outcomes. Four overarching themes along with several sub-themes emerged from the data analysis, including Curricular Integration Considerations, Orientation and Preparation Requirements, VW Technology…Capabilities and Constraints for IP Teamwork Practice, and Achievement of Positive IP Teamwork Learning and Practice.

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Chapter 1: Introduction

> Lisa (participant): It made me aware of a lot of things I still have to learn about my team members in the healthcare realm. I don't know very much about what an RT does or what an RN does and I now appreciate their roles more. I did learn a lot today and you know, it just kind of gives you a better insight into what exactly is going on. There are so many other things that you don't know about and you should not just assume things about others. I might have a little bit more patience in future experiences.

There is an increasing need and desire to create opportunities for interdisciplinary healthcare students to learn from, with, and about one another. This movement is called Interprofessional Education (IPE) or collaborative practice. King et al. (2008) state that "health science educators are increasingly focused on preparing health science students to work in interdisciplinary environments" (p. 1). Research has shown that, whenever healthcare professionals work together as a team in complex scenarios, this team performance will exceed the sum of all individual actions and demonstrate the strength and importance of teamwork (St. Pierre, Hofinger, Buerschaper, & Simon, 2011). Reeves, Lewin, Espin, & Zwarenstein (2010) define *interprofessional (IP) teamwork* as "a type of work which involves different health and/or social professions who share a team identity and work closely together in an integrated and interdependent manner to solve problems and deliver services" (p. xiv). The lack of collaborative practice and a breakdown in IP teamwork skills such as communication, leadership, role clarity, and conflict resolution has been noted to be a major cause of medical errors and adverse events in healthcare (Lingard et al., 2004; Sexton, Thomas, and Helmreich, 2000; as cited in Rogers, Miller, and Firmin, 2012; Sharma, Boet, Kitto, & Reeves, 2011). Healthcare education and practice continues to be influenced by the patient safety movement with increasing oversight and

advocacy (Bearman, 2015) to ensure and promote the importance of patient safety, improved patient outcomes, and a reduction of these medical errors. The Canadian Patient Safety Institute (CPSI) created a comprehensive framework of evidence-based safety competencies including the domains of Work in Teams for Patient Safety and Communicate Effectively for Patient Safety to address the issues of a breakdown in collaborative practice and teamwork skills such as IP communication and are to be used to further guide healthcare educators and employers in the development of patient safety curricula and safer practice in the workplace (www.patientsafetyinstitute.ca). These "soft" or social skills need to be seamlessly integrated and included with the more traditional "harder" skills of patient care (Kommers, 2012). Most, if not all competency frameworks in healthcare education now require the need for practice in an IP learning context prior to graduation in order for students to be prepared for real-world practice (Duncan and Larson, 2012) and safe delivery of patient care. The Canadian Interprofessional Health Collaborative (www.cihc.ca) also promotes the importance of preparing healthcare students for real-world collaborative practice through greater opportunities of IPE and engagement with one another prior to graduation, as communicated in Figure 1.

Figure 1. The Canadian Interprofessional Health Collaborative communicating the silo approach to healthcare education and its impact on teamwork in the workplace.

Scenario-based high fidelity simulation is one instructional method that has become popular among healthcare educators for delivering IPE activities with several studies reporting short-term impacts such as improved communication within healthcare teams (Kenaszchuk, MacMillan, Van Soeren, & Reeves, 2011). Not only is simulation potentially effective for skills development, it is also particularly well suited for team training and soft skills, allowing participants to interact with one another and practice team-based competencies (Fanning and Gaba, as cited in Rogers, 2012). Some of the literature has suggested that one of the greatest developments in high fidelity simulation is the possibility to focus on interpersonal skills training of an entire healthcare team in a safe, no-risk, real-world environment (St. Pierre, Hofinger,

Buerschaper, and Simon, 2011). Beyea and Kobokovich (2004) found that there is a need in simulation-based education within nursing curricula to include non-technical skills required in their profession (as cited in Rogers, Miller, and Firmin, 2012). The rise and use of simulation-based education is "also viewed as a way to reduce medical error and improve patient outcomes" (Bearman, 2015, p. 26) which are often caused by a lack of teamwork, communication, and other soft skills and attitudes mentioned above.

Statement of the Problem

Simulation centers in post-secondary institutions are the most common location for the face-to-face delivery of these types of IPE simulation learning experiences; however, many institutions do not have state-of-the-art simulation centers for their on-campus students. If they do, then they are often challenged with timetable or logistical barriers to bringing various disciplines and cross-campus student groups and programs together to achieve this learning goal. Distance learning students are also disadvantaged as they do not have the same access to IPE learning experiences due to geographic separation and distance from other healthcare student groups. For example, nursing students in the northern region of a province are unable to readily learn with other healthcare discipline students such as medical students that only reside in larger urban centers. Connecting these healthcare students in a traditional, face-to-face simulation setting is cost and time-prohibitive with logistical and educational challenges that outweigh the benefits of effort in attempting this task (Duncan and Larson, 2012).

Alternative and new emerging online technologies have been created and designed to support distance learning (Dickey, 2003) and need to be considered to fill this gap in IPE among healthcare students in both distance learning and traditional, campus-based settings that lack

close proximity to one another. 3-D virtual worlds (VW) are one example of an emerging technology in the healthcare education realm where distance or blended learning students can participate together in a desktop e-simulation, practicing and experiencing the desired team skills that they require for the real world (Rogers, Miller, & Firmin, 2012). This solution may sound attractive in solving this problem; however, VW simulations include their own set of inherent problems and challenges as do most learning technologies, requiring further research in their use in healthcare education.

Previous experiences of the researcher with the proposed use of VWs have not been ideal and have lacked student and other participant engagement in the development and use of this type of instructional method, especially in the field of IPE and teamwork development with healthcare students. A lack of understanding of the overall essence of the experience of a synchronous VW simulation for IP teamwork practice in healthcare students is a problem that has been identified and requires further exploration.

Studies on the topic of VWs tend to focus primarily on single-discipline student groups such as nursing or pharmacy. Other studies explore the use of virtual patients and e-simulations in an asynchronous environment for self-directed learning activities. Literature that investigates cross-discipline or IP healthcare students learning within a synchronous VW simulation is difficult to find at this time (Dickey, 2005; Dickey, 2003; Kommers, 2012; Rogers et al., 2012). Other studies that have addressed related problems in this proposed study focus on elements such as interaction, socialization, design, online synchronous versus asynchronous communication technologies, motivation, and learning theory related to virtual patients and virtual learning environments (Dabbagh & Bannan-Ritland, 2005; Dickey, 2005; Driscoll, 2005; Duncan and Larson, 2012; Edirisingha, Nie, Pluciennik, & Young, 2009; Woods & Baker, 2004). Realism,

verisimilitude, and immediacy are also a common theme in the literature specific to VWs. Some literature can also be found that pertains to distance learning students; however, the emphasis on distance education supported by synchronous VWs is secondary to other themes and topics mentioned above.

Few studies have specifically examined the use of synchronous VW simulations in healthcare education for experiential learning opportunities of IP teamwork competencies. Scant literature exists that specifically addresses the problem of IP healthcare students learning together at a distance in a synchronous VW. There is also a lack of phenomenological understanding of the overall essence and meaning of the participant experiences with this learning technology for the purpose of practicing IP teamwork and justifies the need for further study.

The deficiencies in the past literature has an impact on many post-secondary healthcare programs and institutions as administrators and educators continue to seek efficient, effective, and appealing solutions for bringing healthcare students together for IPE activities within the curricula. Students as primary stakeholders and participants deserve to have a greater amount of input to provide direction in the optimal use of VW simulations for this purpose. Not understanding the overall experience of these stakeholders may result in poor uptake and negative learning outcomes.

Purpose of the Study

The purpose of this phenomenological study was to better understand and describe the essence and meaning of the student experience in practicing IP teamwork competencies within a synchronous VW simulation for interdisciplinary healthcare students in two post-secondary

institutions in Alberta. At this stage in the research, IP teamwork and a synchronous VW simulation are defined as the following:

- *IP teamwork*: Interdisciplinary healthcare students (representing different health professions) working together in an integrated and interdependent manner, sharing a team identity with the goal of solving problems and delivering services (Reeves et al., 2010).
- *Synchronous VW simulation:* An avatar-based 3D VW desktop simulation where IP healthcare students meet together at the same time (synchronous) to experience and care for a simulated patient within a typical environment that replicates a real-world healthcare situation.

Limitations and Delimitations

Healthcare students that were selected as participants for this study may or may not have received previous formal education specific to IP teamwork. Some students may have experienced face-to-face IP simulations while others may not have experienced this type of training. There was also a variation in student experiences with online learning and technologies and the use of VWs. These limitations were considered during the data analysis and reporting of results (Chapter 4) in this study.

A few delimitations were set by the researcher in this current study:

- Two local post-secondary institutions and a criterion sampling of their healthcare student population were included in this study.

- Students were nearing the completion of their education or were able to have graduated within three months. No first year or novice students were selected in the sampling due to their lack of experience and readiness for IP collaboration.
- The length of the entire phenomenon in the online synchronous VW simulation setting would last no longer than 90 minutes.

Research Questions

In this phenomenological qualitative study, the researcher selected a topic and research question that has social and personal significance and carefully reflected on the positioning of each word within the research questions(s) as a method of preparation to guide the subsequent procedures and techniques required for the completion of this study (Moustakas, 1994). The researcher used one or two broad and open-ended central questions followed by several associated sub-questions for the purpose of better understanding the overall essence and meaning of the participants' experiences. Miles and Huberman (1994) suggest no more than a dozen qualitative research questions for a study and that these narrowed and focused sub-questions still remain open and inductive in nature (as cited in Creswell, 2009). Based on this recommendation, the following primary, procedural, and issue research questions were carefully constructed and written with a phenomenological lens for the completion of this study. Most, if not all of these research questions were used to guide the focus group interviews, follow-up individual interviews, and observations during data collection.

Primary Question:

- As the researcher, my primary research question as it now stands is the following (Moustakas, 1994): What are the lived experiences of geographically separated

healthcare students from two post-secondary institutions when exposed to the instructional strategy of a synchronous VW simulation for the purpose of learning and practicing IP teamwork?

Procedural Sub-Questions:

- What contexts or situations have affected or impacted their experiences with this phenomenon?
- What significant statements describe these experiences?
- What themes emerge from the experiences of the participants?
- What is the overall essence of the experiences common to the participants regarding this phenomenon?

Issue Sub-Questions:

- How do participants describe their experiences with synchronous communication(s) and any other technological elements regarding the VW environment?
- What is the participant experience regarding student-student interaction, socialization, and immediacy?
- What is the participant experience regarding student-virtual environment interaction from an immersive/realism/verisimilitude perspective?
- How do participants describe the context or situation for learning and practicing IP teamwork?
- How do the participating students describe their experience specific to the post-simulation *debriefing* within a synchronous VW setting?

- How have the attitudes among the student participants changed toward one another as IP team members following the synchronous VW simulation experience?

Definition of Terms

Creswell (2009) suggests that including a definition of terms section in a qualitative research study has minimal value and priority, knowing that through exploration and an inductive approach, these definitions may expand and change; however, to ensure clarity for the reader with some potentially unfamiliar terms, the author has included a few definitions at the onset of this study.

IP education. The process by which we train or educate practitioners to work collaboratively…changes how healthcare providers view themselves…is a complex process that requires us to look at learning differently…requires healthcare providers to practice in a way that allows for and accepts shared skills and knowledge…requires interaction between and among learners…healthcare providers who are good IP, collaborative practitioners understand the importance of working together with colleagues and the patient/family to achieve the best health outcomes (www.cihc.ca).

Synchronous VWs. An online computer-based entity that can simulate a real-world environment by representing objects to the user, giving the user the impression, as realistically as possible, of being in another place. Through the use of an avatar, a digital representation of the user, people can create, interact with, and manipulate elements of the modelled world and communicate with other users (Haycock & Kemp, 2008, as cited in Rogers et al, 2012).

Simulation. "The creation of an artificial world that imitates reality, with activities that represent a real world situation in the workplace that provides students with practice in problem-based decision making" (Prensky, 2004, as cited in Rogers et al, 2012).

CliniSpace.™ CliniSpace™ is a platform to create immersive and authentic 3D virtual environments that replicate the familiar surroundings of daily work for healthcare professionals. Learners encounter realistic scenarios and problems and can practice alone or in teams, learning to make decisions, to communicate effectively, and to recover safely from errors. CliniSpace™ is a hosted application, accessed over the Internet (www.clinispace.com).

Synchronous communication. A form of live, "real-time" communication in which participants meet at the same time and location, either face-to-face, by telephone, or electronic conferencing (Dickey, 2005; Reeves et al., 2010). Online synchronous communication via voice and text within the VW will be used in this study.

Verisimilitude. "An *illusion of reality*, to induce real world-like responses by those participating in the simulation (Keys & Wolfe, 1990, p. 308, as cited in Cram & Hedberg, 2012).

Immediacy. "Those communicative behaviors that reduce perceived distance between people…enhanced physical or psychological closeness in interpersonal communication" (Mehrabian, 1967; Thwett & McCroskey, 1996, p. 198, as cited in Woods & Baker, 2004, p. 4).

Standardized/simulated patient. "A person who has been carefully coached to simulate an actual patient so accurately that the simulation cannot be detected by a skilled clinician. In performing the simulation, the SP presents the gestalt of the patient being simulated; not just the history, but the body language, the physical findings, and the emotional and personality

characteristics as well" (http://www.aspeducators.org); A real actor or person who has been coached to recreate the history, personality and physical findings of an actual patient in a realistic and consistent manner.

Chapter 2: Review of the Literature

The intent of the completed literature review in this study was to identify some of the issues and themes related to the problem and a scholarly rationale for the purpose of this study. Reviewing the current literature also served the primary purpose of identifying some of the gaps and needs for further research specific to better understanding the lived experience of practicing IP teamwork in a synchronous VW simulation as geographically separated healthcare students. Moustakas (1994) discusses the use of literature in a phenomenological study for framing the research problem within the literature and setting the stage for the inquiry (as cited in Moerer-Urdahl & Creswell, 2004). This chapter will report on some of the most recent and relevant literature specific to this topic and assist in positioning this current study within the current body of knowledge (Creswell, 2007). Several relevant data bases and online search engines were used to complete the literature review including the use of specific search words and phrases related to the research question. As a phenomenological study, it is imperative as the researcher that the *Epoche* is completed after the literature review and *bracketing* of the research question to allow for a clear and open-minded approach, "suspending our understandings in a reflective move that cultivates curiosity" (LeVasseur, 2003, as cited in Creswell, 2007) ensuring an inductive analysis and perhaps a fresh and new understanding of the meaning of the participants experiences with the phenomenon in this study. Moustakas (1994) echo's the same, suggesting that the literature search and review needs to be "put out of play, setting aside these presuppositions *prior* to seeking new knowledge in the experience and data" (p. 49). Although the epoche has been an ongoing exercise throughout the entire study where the researcher continuously returns to this state of mind, it has been positioned and documented at the beginning of Chapter Four (Results and Discussion) in this study.

Providing an Authentic Experience

Instructional design. Murdoch, Bushell, and Johnson (2012) provide two case studies demonstrating the application and importance of instructional design theory in asynchronous virtual patient development using a modified and iterative ADDIE process. Student feedback resulted in a positive response toward the use of e-simulations to enhance their experiential learning and to expose them to a multitude of different situations that will be experienced in professional life (Murdoch, Bushell, and Johnson, 2012). Adding design with a continued evaluative and iterative process ensured quality simulation curriculum for blended learning students using this technology. However, no discussion regarding design for synchronous virtual patients within VW simulations is included in this case study, nor is it easy to find such research in the current literature.

Situated learning. Situated learning is a common pedagogical model within the literature that supports simulated VW learning environments. Situated learning characteristics include the following:

- Learning is situated in the activity in which it takes place and implies doing.
- Meaningful learning will only take place if it is embedded in the cultural, social, and physical context within which it will be used.
- Knowledge is situated, being in part a product of the activity, context, and culture in which it is developed and used.
- Learning methods embedded in authentic situations are highly meaningful for the learner (Brown, et al., 2000, as cited in Kommers, 2012, p. 379).

Synchronous VW simulations that are authentic, true to life, and include the complexities of the real world may provide opportunities for alternative and safer collaborative practice prior to graduation and deployment of healthcare students (Kommers, 2012).

Simulation-based training (SBT). SBT is closely related to the same tenets as situated learning discussed above. Rosen, Salas, Silvestri, Wu, & Lazzara (2008) integrated SBT within graduate medical education programming for enhanced performance measurement of competencies. Rosen et al. (2008) describe several benefits to SBT in healthcare education:

- Accelerates the acquisition of expertise through the provision of structured learning experiences that represent certain aspects of the real world setting and its complexity.
- Exposure to a simulated environment that closely resembles real-life enhances transfer of learning to the workplace.
- SBT is a safe place to practice and tolerant of errors compared to real patient care.
- SBT provides an opportunity for immediate and thorough feedback on the learners' performance due to no other competing priorities in the clinical environment, allowing for rich debriefing post-SBT.
- SBT provides further control regarding the content of experiences, standardizing the experiences for all learners with pre-determined scenarios as opposed to unpredictable events in the real clinical setting.
- Use of structured observation protocols during SBT assist in guiding feedback and performance measurement as well as decreasing variability in student experiences in receiving variable feedback from differing clinicians and educators.

- All simulation technologies have a common goal of providing practice activities for the learner.

The benefits of SBT in graduate medical education (Rosen et al., 2008) mentioned above were applied and exploited in the context of this study of synchronous VW simulations and examined further during data collection and analysis.

Motivation. The importance of motivation in learning is referenced often in the literature specific to active learning strategies such as simulations and VWs. Keller (1984) created a model representing four conditions for motivation that need to be met in order to have a motivated learner (as cited in Driscoll, 2005). The ARCS acronym and model consists of A-attention, R-relevance, C-confidence, and S-satisfaction. It is important to note that much of the literature findings on the use of VWs suggest a high level of motivation in learners. Driscoll (2005) suggests that "simulations of all kinds work well to furnish appropriate learning environments within which students can tackle real-world problems" (p. 337). Each of the four conditions are most often found and promoted in e-simulations supporting online learners and maintaining their motivation for learning in this environment.

Constructivist learning in VW simulations. It is important to note that many learning theories are supported and represented in instructional strategies such as e-simulations and VWs, depending on what instructional model is adopted by the designer or teacher; however, much of the current research on distance education technologies such as VWs and simulations is situated within the constructivist theory of learning (Bruckman et al, 1997, as cited in Dickey, 2005). Constructivist theory "rests on the assumption that knowledge is constructed by learners as they attempt to make sense of their experiences" (Driscoll, 2005, p. 387). Driscoll (2005) continues to

describe constructivist learning goals as an approach that emphasizes learning in context with meaningful activity, acting in situations. Dabbagh and Bannan-Ritland (2005) communicate a succinct and accurate description of constructivist thinking: "Situations, activities, and social interactions are constantly challenging the learner's understandings, which result in new meanings. Therefore, the context or the activity, which frames the knowledge, is as important to the learner as the knowledge itself." (p. 167). VW simulations for IP healthcare team development have the potential to deliver sound instruction based on constructivist tenets and principles. Wood, Solomon, and Allen (2008) succinctly communicate the benefits of this constructivist learning opportunity in a VW simulation setting: "These new platforms provide educators with the opportunity to create real-life simulations in a safe environment to enhance experiential learning; thus, they offer a risk-free way for students to practice skills, try new ideas, and learn from their mistakes (p. 49). It is important to note that Constructivism is not without its critics who feel that the tenets of this theory are lacking; however, it appears that there is a broad acceptance on a few key beliefs:

- Only the active learner is a successful learner.
- Learning from examples and learning by doing enable learners to achieve deep levels of understanding.
- Learning with understanding is what is desired, not rote learning.
- The social structure of the learning environment is important (Driscoll, 2005, p. 407).

VW simulations may support preparation for the real world by offering learners an opportunity to experience certain environments, processes, the people on their team, and decision-making all in a setting that puts no one at risk (Duncan and Larsen, 2012). VW simulations certainly align

with constructivist approaches to learning, but requires further understanding from the learner perspective and experience as in this current study.

A Matter of the Heart

Socialization in VWs. Providing some further emphasis on the social element of the social constructivist nature of synchronous VW technologies is warranted following the general discussion on constructivist learning above. Based on their experiences, Bronack, Riedl, and Tasner (2006) believe that **"**3-Dimensional VWs offer an incomparable environment for creating spaces where teachers and learners separated by distance can engage in the social activity of learning" (p. 220). Vygotsky (1978), a social constructivist, believed that "learning occurs first on the social level and next on the individual one" (as cited in Bronack, Riedl, and Tashner, 2006, p. 221). Bronack, Riedl, and Tashner (2006) state that traditional online learning tools such as asynchronous computer-mediated communication are difficult to promote collaboration and lack a sense of presence, especially the informal kind of presence and social interaction that often occurs on a campus. Nicol, Minty, and Sinclair (2003) find similar results in their qualitative study on the social dimensions of online learning. They found that many students lacked the sense of presence in asynchronous communication as well as the lack of spontaneity that could be found in face to face interaction and often left a learner "hanging" due to a delayed response, thus, losing momentum and motivation in the learning experience. Edirisingha, Nie, Pluciennik, and Young (2009) found positive outcomes in their research specific to socialization in SL and its impact on learning: "A 3-D multi-user VW (MUVE), such as SL, "has the potential to generate a sense of presence among peer learners via their avatars in a 3-D environment through real-time interactions that may facilitate relationship-building, learners' engagement and

motivation" (p. 458). These ingredients for socialization have been found to enhance and improve learning outcomes in distance learning settings.

Professional socialization can be defined as a "process in which individuals acquire the norms, values and attitudes associated with a particular professional group" (Reeves et al., 2010, p. 61). Reeves et al. (2010) suggest that professional socialization may be an impediment to IP collaboration and can often undermine teamwork due to the socialization within one's own profession, leading to a closed professional identity and a low desire or priority for working with others representing other professions. Further research and priority in healthcare education is required to promote not only professional, but IP socialization among healthcare students such as in this study.

Gagne's theory. Although constructivists dominate in third generation distance education and online learning literature, several other learning theories are supported and represented within this proposed topic of interest (Bates, 2005). Driscoll (2005) describes Gagne's theory to be in contrast to the constructivist approach to instruction; however, Gagne's (1972) five major categories of learning outcomes (as cited in Driscoll, 2005) includes an important outcome, *attitudes*, in particular to simulations and VWs. Gagne (1985) defined attitudes as "acquired internal states that influence the choice of personal action toward some class of things, persons, or events" (as cited by Driscoll, 2005, p. 363). Driscoll (2005) suggests that e-simulations are able to potentially help students in examining their own attitudes in multiple situations and can allow students to not only make decisions but also face the consequences of their decisions and actions associated with attitudes. Personal conviction and a change of attitudes can be accomplished in VW simulations. There are several studies that now support the argument that attitude and "affect plays a critical role in decision-making and

learning performance as it influences cognitive processes" (Kinard, 2001; LeDoux, 1998, as cited in Kommer, 2012). It was the intent of this current study to include the examination of the learning outcome of attitude among IP healthcare teams and their attitude changes toward one another as team members from a synchronous VW simulation experience. It is also important to note that cognitive and affective domains of learning in Gagne's taxonomy of learning outcomes are the primary focus when using e-simulations and VWs, whereas psychomotor skills, or "motor" skills are still left to other modes of instruction and were not in the scope of this current study.

Interaction. A significant amount of literature exists on the subject of interaction in distance education. "Distance education environments that support deep learning and high levels of engagement do so by fostering interaction among the people who use them" (Palloff & Pratt, 1999; as cited in Bronack, Riedl, and Tashner, 2006, p. 221). Moore (1989) offered three types of interaction for distance learners: student-student, student-teacher, and student-content interaction (as cited in Woods and Baker, 2004). Literature suggests that VWs used in a synchronous setting have the potential to offer a high degree of interaction at all three levels. Student-student interaction has had particular emphasis in the literature as it has been recognized as an intellectual and affective support for distance learners (Shin, 2002). Shin (2002) also suggests that the need and desire for student-student interaction is dependent on several factors such as learning styles, preferences, sociability, and time.

An even more interesting notion is interaction *with* immediacy. Immediacy can be understood as those communication behaviors that can enhance closeness, or reduce perceived distance between people in interpersonal communication and interactions (Woods and Baker, 2004). This theme is somewhat discussed in other literature specific to the use of avatars in VWs

as well as in online virtual classrooms; however, lacking in any rich data. Bronack, Riedl, and Tashner (2006) suggest that "VWs offer participants a sense of presence, immediacy, movement, artifacts, and communications unavailable within traditional Internet-based learning environments" (p.220). Yee et al. (2006) suggests that avatar form is important as they "elicit an experience of being with another person; or co-presence (also known as social presence)" (p. 361). Bailenson, Merget, and Schroeder (2006) also completed research on the effects of form and behaviors of avatars and found that behavioral and form realism were not always required or beneficial for creating disclosure and a lesser amount of avatar realism was beneficial for introverted or shy students. As discussed above, constructivist advocates support the importance of both interaction and immediacy in online learning technologies such as VWs to support teamwork training and collaborative practice as in this current study. Woods and Baker (2004) state it is important to distinguish between basic dyadic communication and genuine interpersonal and rich contextual interaction as educators seek to improve online education. There is a need to further study this phenomenon within a synchronous, avatar-based VW simulation context to better understand the meaning of interaction and immediacy from a student experience and perspective.

Soft skills. Kommers (2012) provides a case study specific to teaching and attaining "soft skills" in medical students through the use of a 3D virtual "agent" or avatar. Kommers (2012) is driven by the fact that there is a need to provide further research about the use of information and communication technologies (ICT) for the purposes of learning soft skills in healthcare students. This need was further explored in this study as teamwork skills, or non-technical skills are also perceived as "soft skills" and do not only refer to the interaction with a patient as in Kommers (2012) study, but with all of the members of the team.

VW Technologies

Synchronous online technologies. King et al. (2008) investigated the impact of a synchronous communication tool (Elluminate) for teamwork and interdisciplinary education in a blended learning course. Discourse was noted to be a challenge due to the complexity of the technology and limitations to natural conversations in the online environment, creating a "walkie-talkie" mode of communication; however, this limitation of speaking "one at a time" was seen as a positive finding by some students suggesting that it reduced the amount of dominant student interruptions and leveled the "playing field" for all participants (King et al., 2008). The lack of non-verbal cues was also seen as a limitation and impediment to learning effective communication skills. Yet, other literature has found that non-verbal cues have not made a difference in synchronous communication tools. Falloon (2011) completed a study on a synchronous communication tool for creating a virtual classroom experience. Interestingly, students commented on the limited value of the video for non-verbal cues and preferred quality audio instead, suggesting that there really was limited to no value in the "talking head" video and that audio, or voice can also reflect emotion and other elements that facial expression and body language might portray (Falloon, 2011). Synchronous technologies in distance learning has been used to reduce the sense of isolation for learners and increase engagement and motivation; however, forms of synchronous technologies such as VWs are relatively a new phenomenon and need further research to ensure evidence-based practice in this type of learning environment (Falloon, 2011). Current research has found positive outcomes in that "regular interaction between teachers and students in distance education programmes through the use of synchronous systems improves attitudes, encourages earlier completion of coursework, improves performance in tests, allows deep and meaningful learning opportunities, increases retention rates, and builds

learning communities" (Schullo et al. 2007; as cited in Falloon, 2011, p. 188). Williams (2006) study of the effectiveness of distance education in allied health students supports the statement above by finding that synchronous and open learning distance students outperformed traditional classroom students in achievement; however, asynchronous learning models were outperformed by traditional classroom students.

Challenges and barriers to synchronous VWs. Duncan and Larson (2012) completed case study research evaluating the use of various VW simulations for learning in pharmacy students. Although they had positive outcome findings in their work, they also recognize the challenges of the use of technology:

> While the delivery of content and student engagement may appear seamless, professional, and even exciting, there is a very large amount of preparatory work in developing a program, even more so if aspects of the type or use of technologies is unique. This introduces significant cost in terms of the time devoted to the process. Costs are further increased as specialist skills are required for space and technology design and construction. Once completed, ongoing technical support and content management and review are essential. (p. 172)

Duncan and Larson (2012) also warn the reader of Moore's Law that suggests that "technology rapture" is a risk to everyone; computers and new technologies double in capacity every 18 months. There is an obvious risk of allowing technology to drive education design, leading to redundant technologies and a lacking emphasis of instructional considerations for learning. Bates (2005) also warns that new technologies are simply different and that we need to consider the best instructional use of these technologies for distance learning before "jumping on

the bandwagon" of every new gadget available in education. VWs can be perceived to be a new "gadget" and rendered ineffective unless pedagogy is considered first, prior to implementation (Duncan and Larson, 2012). Other challenges such as student orientation to the technology and length of uptake with VWs need to be considered prior to implementation and need to be weighed for cost and time versus benefit compared to other pedagogical models and tools. Leading healthcare researchers are also skeptical in the use of online technologies as it is perceived to have "a limited range of training functions due to its unrealistic settings, and therefore cannot provide an effective problem-based learning environment (Alinier, 2007; Jeffries, 2006; as cited in Rogers, Miller, Firmin, 2012, p 104). Further evidence is required for the research community in the use of online learning technologies such as synchronous VWs for IP healthcare team training.

Research Literature Specific to the Problem

Rogers, Miller, and Firmin (2012) completed a mixed-methods study directly related to this proposed study. Rogers, Miller, and Firmin (2012) explored and evaluated the use of a virtual emergency room simulation for learning in nursing education. Second Life was the clinical simulation platform to deliver the VW experience to nursing students. Rogers, Miller, and Firmin (2012) provide a strong rationale for the need to use simulation as an instructional strategy for teaching both technical and non-technical skills such as teamwork and communication. The study communicates the need for flexible online learning activities such as VWs to support distance learning strategies that allow students to "be actively involved in trying to solve a problem presented to them, by interacting and communicating with their peers, environment, equipment, and patient (Fanning and Gaba, 2008, as cited in Rogers, Miller, and Firmin (2012)). Reducing the sense of isolation for students learning at a distance is also a focus

in this study, including the use of synchronous communication tools within VWs. It is suggested that "effective learning does not occur in isolation, but rather, in teams working together to solve problems (Jonassen, 1998, as cited in Rogers, Miller, and Firmin (2012)). The use of SL is explored in the study as a synchronous learning activity to promote meaningful social interaction and development of team skills in nursing. Rogers, Miller, and Firmin (2012) provide a sufficient summary of the literature specific to simulations and online learning strategies such as SL; however, it lacks grounding in classical learning theories. The study includes pre and post-trial surveys and interviews to capture nursing student attitudes and experiences regarding a clinical simulation created in SL. Nursing students worked in teams of three or four during the VW simulation, providing a clinical context to apply collaborative decision-making and practice as they treated the patient as a team (Rogers, Miller, and Firmin, 2012).

The post-trial surveys and semi-structured interviews included questions that addressed soft skills (non-technical skills) in healthcare settings such as teamwork, communication, critical thinking, leadership, collaborative patient care, and problem solving skills (Rogers, Miller, and Firmin, 2012). The study survey questions further explored student engagement in the VW simulation, whether it encouraged active participation and teamwork, its ability to allow for application of nursing concepts, and finally student perceptions of the general use of e-simulations in nursing education (Rogers, Miller, and Firmin, 2012). Research findings and results included positive data supporting the use of SL for teamwork development and practice. The use of technology had no negative implications or results and the majority of students found no technical problems to occur during the study. All participants agreed that the simulation assisted them in developing their problem-solving, critical thinking, leadership, and teamwork skills and the ability to work as a team in a virtual setting (Rogers, Miller, and Firmin, 2012). An

important survey result was the fact that students were very open to using this type of online learning technology to learn with students from other campuses and programs, perceiving that this learning tool would support socialization and promote professional relationships (Rogers, Miller, and Firmin, 2012). Rogers, Miller, and Firmin (2012) suggest that further research would be valuable as they suggest that little is understood about simulating teamwork in e-simulations and how best to create these event-based types of simulation scenarios that optimize student collaboration in a multi-user, synchronous virtual learning environment. This current study has taken a similar, yet unique approach by implementing an IP clinical context within the VW for team training. It is important to note that only nursing students were included on the team in this study and that further research is required in the literature specific to interdisciplinary teams learning together in VW simulations, thus the positioning and need for this current study.

Other literature that is closely related to this current study includes an article that explored 3D VWs and their pedagogical affordances and constraints for synchronous distance learning (Dickey, 2003). Specifically, Dickey (2003) explored a 3D VW application and how this technology may support a constructivist learning environment for distance learners. Affordances and constraints that are examined include the discourse tools, the experiential tools, and the resource tools within the synchronous VW course under investigation. Dickey (2003) provides a succinct summary of constructivism and its application to VW learning environments prior to describing the purpose statement and research design for the study. Her constructivist theory resonates and reinforces the constructivist thinking discussed earlier in this paper. Dickey (2003) selects an evaluative case study qualitative approach as her methodological framework for this investigation and used data from participatory observations and notes, class logs, screen captures, and formal interviews with the instructor leading the online virtual course. Several of

these procedures have been adopted in this current study with the added emphasis of a phenomenological approach. Findings from the data collection and analysis supported the use of 3D VWs for constructivist types of learning for geographically distant students; however, some constraints did exist specific to the discourse and experiential tools within the VW course. The discourse tools created opportunities for immediate peer and instructor feedback and support as well as collaboration, social negotiation, and peer mentoring; however, text-based communication, font type selection, and a lack of provisions for turn-taking had a negative impact on communication although most participants felt that these issues were circumvented and did not impede learning (Dickey, 2003). Dialogue and discourse was still rich, particularly with the use of avatars that created a sense of presence and immersion for the synchronous learners.

The experiential tools showed some constraints due to a lack of collaborative tools within the VWs such as whiteboards and other collaborative writing tools. These limitations and constraints are specific to this particular VW platform and do not necessarily apply to other platforms (Dickey, 2003). Another limitation of importance is that the students were already familiar with the technology and the constraints of the learning environment, thus, were able to mitigate and work within these constraints. Further research should be explored to address these issues that were identified in this study such as the variation of students not being familiar with the technology as in this current study. Dickey (2003) suggests other opportunities for further research including collection of data from learner perspectives regarding the medium of synchronous VWs, as well as a discourse analysis of the discourse tools within a VW which may reveal the dynamics of interaction among learners. Nevertheless, this article provides some evidence that synchronous learning experiences in VWs afford multi-user discourse and

experiential opportunities for distant learners to promote collaboration and teamwork in real-time and was further explored in this study.

Summary and Proposed Contribution to Distance Education Research

There is a significant amount of knowledge available in the literature specific to this new study, providing a foundation of theoretical underpinnings to support further research. Highlights and major themes in the literature specific to VWs, online synchronous IPE, and distance learning were briefly reviewed in this chapter. Themes such as synchronous versus asynchronous communication, interaction and immediacy, social engagement for learning, learning theory and pedagogical implications, and challenges in the use of technology for learning can be found in the literature specific to this topic; however, there is little evidence and research that has been completed that addresses the problem, purpose statement, and research questions in this study.

A few of the suggestions for further research in the reviewed literature supported the desire to pursue this research study further. For example, reviewing student feedback and understanding of their experiences, perspectives, and needs is critical to providing effective learning activities that benefit the student learning experience. Non-consideration of their attitudes and feedback lead only to less than ideal and appealing instruction (Murdoch, Bushell, and Johnson, 2012). There is little empirical evidence found in the literature specific to better understanding the lived experience of the learner, including their perspectives and their attitudes, on the technical feasibility and trainee acceptability of a synchronous VW simulation to practice IP teamwork with avatar patients and peers. Exploring the meanings of the learner experience, their perspectives, and attitudes was the focus and intent of this study. Future research opportunities may include the exploration of other perspectives and experiences of the remaining

participants such as instructors, facilitators, and actors within the VW, capturing the overall essence of the VW experience for all stakeholders.

Bronack, Riedl, and Tashner (2006) suggest future research opportunities including the need to explore what kinds of interactions are necessary to develop a successful learning environment and secondly, what this environment might look like. Woods and Baker (2004) suggest further research to explore distance education technologies that promote interaction with increased immediacy. Edirisingha et al., (2009) also suggest further research: "The nature and properties of social presence created through avatars and the resultant socialization have been little investigated using empirical methods (p. 459). This current study included research questions that explored these issues to distinguish between mere presence in an online setting for dyadic communication and the presence of genuine interpersonal and contextual social interaction to improve online IP teamwork practice opportunities for geographically-separated students through the use of VW simulations.

All of the suggestions for further research identified from the literature review above were considered and have influenced the purpose statement and the development of the research questions for this current study. Figure 2 summarizes the primary opportunities for positioning this phenomenological study within the current body of knowledge and literature through the better understanding of the lived experiences of the participants in this study.

Positioning of Current Study in Literature Review
• Instructional design considerations for virtual patients in VWs? • Situated learning in VW settings? • Simulation-Based Training in VWs? • Changes in student *attitudes* with VW simulations specific to IP teamwork? • Socialization in VWs? • Immediacy for IP teams? • Authentic communication in VWs? • Soft skills development for both patient and team interaction? • VW technology as an acceptable learning environment? • IP, not just single-discipline teamwork training?

Figure 2. Positioning and potential contribution of the current study within the various themes found in the literature review.

Chapter 3: Methods

As stated in Chapter 1, the purpose of this phenomenological study was to investigate and better understand the geographically separated healthcare student lived experience (representing two post-secondary institutions in Alberta) in practicing IP teamwork within a synchronous VW simulation. Moustakas (1994) provides further structure to a phenomenological study, suggesting the researcher to organize the techniques and procedures requirements that make up the methods section of a study in terms of (1) Methods of Preparation, (2) Methods of Collecting Data, and (3) Methods of Organizing and Analyzing the Data.

Methods of Preparation

Restatement of purpose of study and research question(s). The research question(s) that were investigated in this study were encoded with the language of the phenomenological approach to inquiry (Creswell, 2007) as part of the method of preparation, which was discussed earlier in Chapter 1, and included the following:

Primary Question:

- What are the lived experiences of geographically separated healthcare students from two post-secondary institutions when exposed to the instructional strategy of a synchronous VW simulation for the purpose of learning and practicing IP teamwork?

Procedural Sub-Questions:

- What contexts or situations have affected or impacted your experiences with this phenomenon?
- What significant statements describe these experiences?

- What themes emerge from the experiences of the participants?
- What is the overall essence of the experiences common to the participants regarding this phenomenon?

Issue Sub-Questions:

- How do participants describe their experiences with synchronous communication(s) and any other technological elements regarding the VW environment?
- What is the participant experience regarding student-student interaction, socialization, and immediacy?
- What is the participant experience regarding student-virtual environment interaction from an immersive/realism/verisimilitude perspective?
- How do participants describe the context or situation for learning and practicing IP teamwork?
- How do the participating students describe their experience specific to the post-simulation *debriefing* within a synchronous VW setting?
- How have the attitudes among the student participants changed toward one another as IP team members following the synchronous VW simulation experience?

The research questions were further consolidated into eight questions for the focus group interview protocol (see Appendix).

Philosophical assumptions of transcendental phenomenology and qualitative research. Before we explore the phenomenological Methods of Collecting Data and Methods of Organizing and Analyzing the Data used in this study, it is imperative to include a brief discussion regarding the philosophical presuppositions of phenomenology. Creswell (2007)

defines the purpose of a phenomenological study to "describe the meaning for several individuals of their lived experiences of a concept or a phenomenon" (p. 57). Moustakas (1994) describes phenomenology as "methods and processes aimed at discovery to find the underlying meanings of important human experiences" (p. 18). Beyond these individual descriptions, phenomenology strives to describe the essences, or common experiences of all the participants as a whole; a research design which acquires and collects data that explicates the essences of human experiences (Moerer-Creswell, 2004). Phenomenology has strong roots in German philosophy by individuals such as Heidegger and Husserl who seek to better understand the "life world" known as *Lebenswelt* or the lived human experience (Laverty, 2003, as cited in Moerer-Creswell, 2004). Several overlapping philosophical assumptions and approaches to phenomenology exist within the literature, including distinguishable and unique strategies for conducting phenomenological research.

Concepts of Moustakas (1994) *transcendental* phenomenology approach, based on Husserlian phenomenology methods have been selected as the best suited approach to address the problem, purpose, and research question(s) in this study specific to better understanding the lived experiences of geographically separated healthcare students with practicing IP teamwork in a synchronous VW simulation. Pertinent concepts, language, and philosophical assumptions of transcendental phenomenology that were applied in this study included the following:

- The pursuit of meaning and a succinct description of the "universal essence" of an experience by participants as a whole is at the heart of transcendental phenomenology.
- An exhaustive exploration of the lived experiences by all individual participants is continuously reduced through repeated acts of reflection and returning to the data, leading to a description of this common, universal essence of the experience as described

above, to better understand and "grasp the very nature of the thing" (van Manen, 1990, p. 177, as cited in Creswell, 2007).

- Transcendental phenomenology has many similarities to other approaches in qualitative research, but is distinct in the manner in which the researcher "launches" the study, beginning with the researcher reflectively setting aside their own presuppositions, prejudices, and prejudgments with the phenomenon as much as possible (Moustakas, 1994), known as *Epoche.* The Epoche is "a preparation for deriving new knowledge" (Moustakas, 1994, p. 85) and includes the *bracketing* of the experiences of the participants with the phenomenon; to shut out all existing understanding and experience of the phenomenon to allow for a "fresh, new, and naive" look at the world with openness and receptiveness through the eyes of those who have lived experiences with the phenomenon on hand. The phenomenon lies within the brackets, "keeping out" the everyday preconceived biases and judgments of the phenomenon, thus allowing for a transcendental attitude created by and from the participants perspectives and experiences (Moustakas, 1994, as cited in Conklin, 2007).
- Moustakas (1994) suggests completing the epoche at the onset of the study prior to data collection. The concept of the epoche and bracketing of the phenomenon is also continually revisited by the researcher as the data is collected and analyzed during the study. This epoche and bracketing process is another step in ensuring validity of the data collection and analysis, maintaining objectivity of the data (Shosha, 2012).
- The term transcendental, "in which everything is perceived freshly, as if for the first time" (Moustakas, 1994, p. 34) is used to emphasize how the researcher needs to see the phenomenon under study with a fresh, new perspective as mentioned above, thus, an

opportunity to transcend above "what is already known" regarding the existing understanding and assumptions of the phenomenon and separate from the participants description (Shosha, 2012). Moustakas (1994) writes, "Phenomenology attempts to eliminate everything that represents prejudgment, setting aside presuppositions and reaching a transcendental state of freshness and openness, not threatened by the customs, beliefs, and prejudges of normal science" (p. 41).

- Transcendental phenomenology de-emphasizes interpretation; instead, it focuses on the meaning and description of these meanings and experiences of those who experienced the phenomenon (Creswell, 2007).
- Moustakas (1994) discusses the *noema-noesis correlation;* for every noema, there is a noesis. The "perceived as such" is the noema; the perfect self-evidence is the noesis. "This relationship constitutes the intentionality of consciousness*"* (p. 30). The concepts of noema and noesis refer to meanings that are embedded within an experience, which need to be "recognized and drawn out" (Moustakas, 1994, p. 69). Furthermore, Moustakas (1994) describes the noema as "that which is experienced, the *what* of experience-the object correlate. Noesis is the way in which the what is experienced, the subject-correlate" (p. 69). Moustakas suggests that the continuous "back and forth" wrestling of the noema and noesis leads to the provision of a core understanding of an experience.
- Phenomenological reduction, a term and strategy within this philosophical assumption begins with the epoche and bracketing of the phenomenon, followed by "gazing" upon the phenomenon as it would be the first time, to "capture the constituents of the moment experienced within brackets in its singularity, in and for itself (Moustakas, 1994, p. 34).

Phenomenological reduction includes the identification of horizons, or horizonalization; the step of identifying significant statements that emerge as data extracts which eventually will reach saturation, be refined as invariant horizons, clustered into meaning units and themes, and used to create a rich, exhaustive textural description of the phenomenon that represent the various dimensions of the phenomenon (Conklin, 2008).

- The exhaustive description at the end of a phenomenological reduction is comprised of a narrative that describes "what" the participants experienced, known as a textural description as well as 'how" they experienced it, known as a structural description (Moustakas, 1994).
- The concept of imaginative variation follows the process of phenomenological reduction allowing for further "brainstorming" and divergent exploration of the data; to vary the possible meanings of the horizons or data extracts through imagination and "free fancy" (Conklin, 2008) with the intent "to arrive at the underlying structures, dynamics, and precipitating factors that account for what is being experienced" (Moustakas, 1994, p. 98). This phenomenological assumption and step in the process leads to the creation of the structural description of the phenomenon mentioned above.
- The essence of the experiences of the participants with the phenomenon is finally captured in a woven together composite textural and structural description.
- Transcendental phenomenology follows specific procedures to organize and analyze phenomenological data and is accomplished through a systematic, rigorous manner but with a continued reflexivity and inductive nature as in other forms of qualitative research.

To summarize the philosophical assumptions above regarding transcendental phenomenology, we will return to Moustakas (1994):

> Transcendental phenomenology is a scientific study of the appearance of things, of phenomenon just as we see them and as they appear to us in consciousness. The challenge is to explicate the phenomenon in terms of its constituents and possible meanings, discerning the factors of consciousness and arriving at an understanding of the essence of the experience (p. 49). The shift from a phenomenon and our perception of it to reflective examination of our conscious experience of it occurs throughout a phenomenological study. (p. 72)

Further discussion of the transcendental phenomenological procedures and approach to data collection and analysis applied in this study are discussed later in this chapter.

A qualitative research strategy. Creswell (2007) summarizes five philosophical assumptions that lead to the selection of qualitative research, namely, "ontology, epistemology, axiology, rhetorical, and methodological assumptions" (p. 15). These philosophical assumptions shape a qualitative study and guide the researcher throughout each component of the process. It is important to note that paradigms, or worldviews, are closely related to philosophical assumptions and further guide and reflect the stance of a researcher (Creswell, 2007). In this study, the researcher included a post-positivist worldview to ensure rigor and to meet the needs of the scientific community and reader who may have a background in quantitative research. A social constructivist worldview was also present and guided this qualitative research study in that understanding was explored through several subjective meanings of an experience; the meanings were varied and complex in nature and required the researcher to rely heavily on the participants views of the phenomenon; these meanings surfaced through the interaction with others, emphasizing the social aspect of constructivism (Creswell, 2007). The researcher also attempted to "bracket" themselves as much as possible and took a curious stance in order to capture and

report the participant meanings and experiences with the phenomenon, thus, supporting this worldview further.

Creswell (2007, 2009) also lists several characteristics of qualitative research that are embedded within these philosophical assumptions and worldviews mentioned above. The characteristics that are present in this current study include the use of 1) a natural setting, 2) researcher as a key instrument for collection of data, 3) the use of multiple sources of data, 4) an inductive data analysis approach, 5) a focus on participants' meanings, 6) an emergent design, 7) inclusion of a theoretical lens, and 8) provision of a holistic account of the VW simulation phenomenon.

As described above, the general qualitative research procedures within a transcendental phenomenological approach was deployed as the strategy of inquiry for this study to achieve the outcome of describing the overall essence and meaning of the geographically separated student experiences with synchronous VW simulations as an instructional method for learning and practicing IP teamwork. It is imperative to have a deeper understanding of these common experiences in order to develop best practice strategies in future healthcare education initiatives related to this topic.

The impact of a phenomenological approach. As mentioned above, a phenomenological qualitative strategy shaped the components of the procedures in this study in the following manner:

Primary research question and sub-questions. Broad, open-ended questions were used to collect the experiences from participants. Narrowed sub-questions provided additional focus on

the primary issues and topics; however, these questions remained open-ended and inductive in nature.

***Data collection*.** Data was collected only from the individuals that have experienced the phenomenon. Focus group interviews were the primary form of data collection in this study.

Data analysis. The phenomenological approach required substantive coding efforts in reviewing the data and capturing significant statements and bringing them together in "clusters of meaning" (Creswell, 2007, p. 61), leading to a structural and textural description of these clusters and themes.

Final narrative. This selected procedure required a rich summary of the participants overall essence of the experience with the phenomenon in this study (Creswell, 2009).

Methods of Collecting Data (Data Collection Procedures)

The researcher selected sites and individuals for this study that were able to purposefully provide a better understanding of the research problem and phenomenon under study (Creswell, 2007). A *criterion* sampling strategy was used to select the sample participants. In phenomenology, it is paramount to select a sampling of participants and sites that have experienced the phenomenon. Primary criteria in the selection process included (1) healthcare student participants that were either nearing completion of their program or had graduated within the last three months that had either completed an IP education course or experienced IP collaboration within a clinical practicum setting, (2) each student participant would ideally represent a different healthcare discipline (or a minimum of three disciplines represented in each student group), and (3) students from two post-secondary institutions within close proximity were solicited to be participants in the study to mimic future distance IPE learning activities between both campuses and for ease in data collection.

The research and data collection occurred at a post-secondary institution in Alberta; as mentioned above, student participants from two post-secondary institutions with close proximity were represented in this study; however, all of the students met on one campus for ease of data collection and execution of the VW simulation phenomenon. The participants in each VW simulation experience included (1) either three or four IP healthcare student participants, (2) one instructor facilitator (the researcher), and (3) one standardized, simulated patient. The VW simulation was repeated three times with three different cohorts of participants as described above. The target sample size of 12 subjects was not realized as two participants that had signed up for the study cancelled on their scheduled dates, leaving a total of 10 subjects that participated in this research study. Table 1 below provides a summary of the participant names (pseudonyms), their represented healthcare discipline, school, and focus group.

Table 1

List of co-researchers as participants in the study including the participants' discipline of study, represented school, and assigned cohort/focus group in the study.

Pseudonym	Discipline	School	Focus Group
Jane	Medicine	A	1
Leona	Nursing	A	1
Conrad	Paramedic	B	1
Lisa	Paramedic	B	2
Susan	Respiratory Therapy	B	2
Irene	Nursing	A	2
Jon	Paramedic	B	3
James	Paramedic	B	3
Sara	Nursing	A	3
Diane	Respiratory Therapy	B	3

The events of the phenomenon under investigation included the following procedures:

Pre-reading and preparation. Each student participant was offered pre-reading electronic documents on IP teamwork as well as received access to the VW software with orientation instructions prior to the day of the event (self-paced). This was an optional step for the subjects as the researcher included the necessary information, subject matter content, and VW orientation as part of the phenomenon.

Participant arrival on campus. Student participants were pre-assigned to a cohort, each made up of four IP students. Three cohorts of four students each were scheduled at different meeting times and experienced the same phenomenon at the research site campus. As mentioned above, two subjects did not attend their scheduled dates which resulted in only one cohort of four students and the two others with three students each.

Participant room assignment. Each of the four student participants in the three cohorts were assigned a laptop computer (with a headset) and their own separate room, simulating "distance learning" or geographical separation and a multiple-campus experience for the study.

Online lecture/group discussion on IP teamwork. The subjects participated in a brief group discussion regarding IP teamwork concepts with the instructor participant (researcher) prior to the start of the simulation phenomenon. This initial discussion occurred within the VW in a "meeting" area. IP teamwork competencies that were addressed in the pre-reading and didactic content can be found in the appendix. Length of time=15 minutes.

VW orientation. Following the discussion above, an orientation of and within the VW occurred prior to the simulation as a group activity exercise. Participants had an opportunity to familiarize and test any of the equipment and other environmental elements within the VW during this time. Length of time=15 minutes.

Simulation briefing/case stem. The students were given a case stem, also known as a briefing prior to starting the simulation and patient encounter. This briefing was provided by the participant instructor (researcher). Length of time=five minutes.

Simulation scenario: The students, instructor (researcher), and simulated patient participated in the actual simulation experience. The student participants treated the patient accordingly as an IP team. The simulation scenario was pre-determined and programmed within the software of the VW, providing the structure of the clinical case. Student participants interacted with one another, the simulated patient, two confederate role-play avatars (physician and nursing assistant roles) and the VW environment to collaboratively care for the patient. The researcher assessed the IP teamwork skills and competencies demonstrated throughout the simulation as well as recorded further observations for use in the debriefing portion of the phenomenon. The researcher also used an observation protocol to record field notes specific to the research questions. Further description of the scenario can be found in the appendix. Length of time=20 minutes.

Post-simulation debriefing in the VW. The instructor (researcher) clearly stopped the simulation in the VW and immediately began a debriefing of the clinical case with the students using clearly defined learning objectives and recorded observations of IP teamwork performance findings. The debriefing occurred at the "bedside" within the VW. Length of time=30 minutes.

Focus group: Following the closure of the debriefing, the researcher thanked all of the participants and after a short rest period, congregated the subjects into a boardroom face-to-face setting on campus and immediately began the focus group interview using the interview protocol (see appendix). Data collection tools that were used during the focus group interviews included two audio recording devices and field note protocols (see Appendix). Length of time= 45-60 minutes.

Video screen capture. The entire phenomenon in the VW was recorded one time (Focus Group 3) with video/screen capture software for data collection and further analysis.

- Total time commitment per cohort/student participant = 2.5 hours.

Additional methods of data collection. In addition to the focus groups mentioned above, a few one-on-one interviews were conducted only as needed to further clarify and complement the richness of the transcripts from the focus group data collection. A phenomenological study most often includes in-depth and detailed one-on-one interviews as a primary data collection strategy (Creswell, 2007). The procedure of three focus group interviews was the primary source of data collection in this current study; however, some one-on-one interviews were completed via face-to-face meetings or by telephone for follow-up and confirmation or clarity of the focus group transcripts. The researcher simply recorded field notes but no audio recording or additional verbatim transcripts of the follow-up interviews. Observational data collection of the live simulation was collected by the researcher with the use of an observation protocol. Due to technological difficulties, only one of the three cohorts was recorded live with a screen capture recording software program (including participant dialogue/audio) while completing the VW simulation for further data collection, reflection as researcher, and data analysis.

Strengths and weaknesses existed within each of the types of data collection in this study. For example, focus groups provided interaction and synergy among interviewees but may have been limiting due to dominant individuals overshadowing others. A few one-on-one interviews provided rich, personal accounts of their experiences, but if individuals were introverted or felt unsafe and intimidated by the researcher, they may have provided sub-optimal data, limiting the understanding of the phenomenon (Creswell, 2007). These examples of limitations and strengths

of each of the employed data collection strategies justified the use of multiple methods of data collection to enhance accuracy and credibility in the analysis phase of the study. Multiple types of data collection was used to add rigor and triangulation of the data collection and analysis process. Triangulation is a "research technique in which researchers compare the findings of different methods, theories and/or perspectives of different people to generate more comprehensive insights" (Reeves et al., 2010, p. xvi). An interview and observation protocol is included in the appendix of this proposal for further information. Creswell (2009) provides suggestions and criteria to be included in the creation of these protocols and was utilized in this study.

Methods of Organizing and Analyzing the Data (Data Analysis Procedures)

It is important to have a defined procedure to data analysis specific to the selected qualitative approach. Creswell (2007) provides several references and examples of acceptable procedural steps to phenomenological research and data analysis. The following procedure, based on Creswell's suggestions (2007) was applied to the data analysis in this study.

First, the researcher took the opportunity to once again complete the epoche, describing their own personal experiences with the phenomenon under study in order to "bracket" or set aside their perspectives and to redirect attention to the participants' experiences within the data. Second, the researcher identified and created a list of significant statements from the data specific to how the ten individuals within the three focus groups experienced the phenomenon; these statements were given equal value at this stage of analysis. The invariant, non-repeating horizons from the data extracts were then identified from the significant statements. Third, the researcher created meaning units or themes by grouping these horizons and verbatim significant

statements. Fourth, the researcher wrote a textural description of the experience in the form of a thematic analysis, describing "what" the participants experienced with the phenomenon and included rich descriptions and quotations from the data sets. Fifth, the researcher then wrote a structural description of the participant experiences describing "how" the experience happened or occurred for the participants. Finally, the last procedure included writing a thorough but succinct summary that encapsulated a composite textural and structural description, describing the overall essence or common experience of the participants. The modified transcendental phenomenological procedures above were applied in the data analysis activities throughout this research study.

In addition to the phenomenological approach to data analysis above, Creswell (2009) suggests general activities of qualitative data analysis which were also included in the data analysis of this current study, including the following:

Prepare the data for analysis. The three focus group interviews were transcribed from the audio recordings; all field notes from observations as well as the recordings of the VW simulations were also prepared for review and analysis.

Complete a broad review of the data. The researcher spent a significant time reading all of the data and reflecting on "what and how" the participants experienced the VW simulation phenomenon. Preliminary "soft" coding was completed and reflection notes recorded during this stage of analysis. Moustakas (1994) describes this step as a time to simply "wait in pure surrender on what is actually given. We then describe that which "appears as such", faithfully and in light of perfect self-evidence" (p. 70).

Complete a formal coding process of the data. After deep reflection and review of the data, each significant statement, "chunks" of paragraphs, sentences, and observations from field notes were identified with a label or code to begin organizing and capturing the essence of the experiences of the participants. In congruence with phenomenological procedures, an inductive approach to this coding process was taken in this study in that emerging codes from the data were identified with a continued focus and returning to the primary research question, acting as the filter and lens for the data analysis. These inductive codes were further defined and recorded in a qualitative codebook, knowing that this codebook would evolve and expand throughout the analysis phase. Hand-coding as well as the use of a word-processing computer program was used to assist in this step of data analysis.

Interpret the meaning of the data. Once the coding process was completed and specific themes or categories were identified, the researcher communicated the results in a narrative form as well as with pictures, figures, and tables. The literature review and theory related to this phenomenon was referenced to confirm, challenge, and expand previous literature and suggested new research questions that emerged during the analysis of the data.

The general qualitative research procedures described above are also consistent with an *inductive thematic analysis* approach which was used to assist in the preparation and communication of the textural description. Braun & Clarke (2006) suggest six phases in completing a thematic analysis and were adopted to complement and support the phenomenological reduction approach in this study: 1) Familiarizing yourself with your data, 2) generating initial codes, 3) searching for themes, 4) reviewing themes, 5) defining and naming themes, and 6) producing the report.

Strategies for Validating Findings

Qualitative research defines validity and reliability differently than quantitative research and uses different procedures in ensuring validity and reliability. Q*ualitative validity* "means that the researcher checks for accuracy of the findings by employing certain procedures, while *qualitative reliability* indicates that the researcher's approach is consistent across different researchers and different projects" (Gibbs, 2007, as cited in Creswell, 2009, p. 190). Moustakas (1994) suggests "verification of the meanings and essences of the phenomenon by returning to the participants and sharing the meanings with them, looking for accuracy and comprehensiveness" (p. 18), an exercise called communalization. This act of communalization was completed in this study as one method of validating the accuracy and reliability of the findings, occurring throughout the analysis as well as a post-data analysis exercise. Creswell (2009) suggests several other qualitative validity and reliability procedures or strategies for the purposes of "trustworthiness, authenticity, and credibility" (p. 191) of the findings; the following procedures were implemented in this study:

- *Triangulation* of the various data sources for a richer explanation and greater accuracy of the overall essence of the participant experiences. Focus group transcripts, one-on-one interviews, observation field notes, and the recording of one of the VW simulations were used in the data collection and analysis, promoting and demonstrating this triangulation process in this current study.
- *Member checking*, a process synonymous with communalization discussed above, consists of follow up meetings or interviews with participants to discuss the data analysis findings and the overall essence summary of the phenomenological study, which once again, occurred during and after the researcher completed the first draft of the analysis.

The researcher sent copies of the analysis to each participant and requested a response as to its accuracy and any changes that would present more clearly or fully the experience of the phenomenon (Moustakas, 1994). The participant comments from this validation process were included and embedded in the final description and synthesized essence statements in this study (Creswell, 2007).

- A deeply detailed and thorough description of the data analysis and findings were included in this study, adding validity to these findings and provided the reader with a richer "painting" of the experiences with this phenomenon under study.
- An attitude of reflexivity is present in the communication of the findings and includes the *epoche* as well as the researchers own testimonial of their own experiences with the phenomenon and its impact on the essence summary in the study.
- Discussion of discrepancies and conflicting evidence from the data were included in the narrative summary to add credibility and honesty.
- A *peer debriefing* where another person(s) reviews and asks questions about the study and data was also completed as a validation technique in this study. Peers that are experienced with qualitative research and that are removed and impartial to this study were identified for enhanced objectivity in the peer debriefing. One peer from the researchers own institution as well as two peers from another post-secondary institution with healthcare, simulation, and qualitative research experience were approached to peer review both the entire research study as well as components of.

Each of the strategies above were attempted to further enhance the validation procedures of the study and its findings.

Narrative Structure of the Study

This study applied several procedures to the narrative structure. These procedures represent general qualitative research narrative writing techniques in the context of a phenomenological approach to qualitative reporting of findings.

Presentation of a comprehensive textural and structural description of participant experiences were included in the narrative with a final succinct description of the overall essence and meanings of the experience with the phenomenon. The narrative structure includes a "detailed descriptive portrait" (Creswell, 2009, p. 193) which provides the reader with an exhaustive summary and understanding of the study and findings. The narrative structure contains several verbatim quotes and descriptions from the participants and their experiences, acting as a voice on behalf of the individuals to communicate their experiences to the research community specific to synchronous VW simulations as an instructional tool for practicing IP teamwork in geographically separated healthcare students. Tables and other forms of information "that are appealing and pleasing to the eye" are used in the narrative to maintain the interest of the reader. As mentioned earlier, the narrative also compares the findings from the study with current literature and discusses similarities as well as divergent results. Emphasis on the participant experiences were stressed throughout the narrative; however, the researchers perspectives are also included both implicitly as well as explicitly in the description of the findings. The draft of the narrative was shared with several of the participants as co-researchers in the study prior to completion of the research to once again ensure validity and reliability. This act of validation is one of the major strengths in qualitative research (Creswell, 2009).

Anticipated Ethical Issues

This study included full submissions to three different Research Ethic Boards (REB) at their associated institutions, receiving full approval from each of them prior to recruitment of the participants. Each approval letter has been included in the appendix. Some of the anticipated ethical issues that could have arose from this study are further discussed below.

Consent. It is important to gain informed consent from all participants with full-disclosure of the intent of the study. A consent form was created and issued to all participants prior to any engagement in the study. Creswell (2009) provides a list of elements to be included in a consent form which were used as a guide to create the informed consent form in this study (see appendix).

Marginalization of specific healthcare disciplines. Not all healthcare disciplines were represented in this study which is an assumption that most readers would accept and understand from a logistics perspective. A potential ethical concern was any marginalization or improper representation of any *one* healthcare discipline that was participating in the study. This risk was mitigated through communicating equal value and importance of all healthcare disciplines and is the essence of IPE which was promoted through the phenomenon under investigation.

Simulated/Standardized Patient in VW. Perpetuating certain stereotypes or characteristics of patients and/or ethnicities could have been an ethical risk in this study. Therefore, due diligence was taken to create a simulated patient within the VW that was generic and not unique to one particular group of people of ethnic, cultural, or religious background.

Vendor Participation in Study. One particular vendor partner was selected and used as the actual VW environment in the study. This vendor provided no financial contributions and remained objective and removed from any data collection or analysis throughout the study. The researcher did not need to purchase access time to the VW for the purposes of completing the study and did not receive any personal favors from the vendor, thus, preventing any potential risk for a conflict of interest.

Disturbance of Computer Labs in the Host Institution. Four laptop computers at the host institution site involved in this study were used and required upload of software in order to participate in the vendor-provided VW environment. Permission from information technology (IT) specialists and administration occurred in this study to ensure minimal disruption of these computers or any other IT-related systems.

Protection of Privacy of Participants. The participants were not identified in the data collection and analysis with names being replaced with pseudonyms; the two post-secondary institution names were also excluded and hidden for protection of privacy. Identification and organization of data occurred with the use of alpha-numeric symbols. All documents and audio-visual recordings are secured and accessible only by the primary researcher.

Ownership of Data. The principal investigator of this study is the owner of the intellectual property in this study.

Inaccurate or Misinterpreted Data. The researcher provided an accurate interpretation and account of the data by including several validating strategies such as continual check points with all participants and their review and repeated input on the interpretation of the data.

The Narrative. Communicating the findings of the research runs a risk for ethical problems. Covering or withholding any significant data or falsifying findings are obvious ethical dilemmas that would require stiff penalties for the researcher. To ensure unbiased and truthful communication of the research, the narrative in this study was reviewed by the participants as co-researchers to ensure accuracy of quotations, significant statements, and other content in the narrative.

The ethical issues mentioned above could have arose throughout this study and were addressed with close attention by the researcher to ensure an ethical experience for all participants and for the research community who will be consumers of this study.

Preliminary Pilot Findings

A pilot of the proposed research study was included prior to conducting the formal research activity and data collection of the phenomenon. The intent of the pilot was to ensure readiness for the study including minimal technological problems with the computers, the software of the web-based VW, and the developed simulation content and unfolding scenario. Another goal of the pilot was to evaluate the effectiveness of the interview protocol and observation protocol instruments used in the study. The pilot utilized faculty/staff volunteers from the host institution in lieu of students. The researcher recorded pilot findings and applied these field notes and observations, thus, further enhancing the protocols and the actual phenomenon experiment prior to the implementation of the study.

Expected Outcomes

It is often difficult to predict the expected outcomes in qualitative research with its inductive and emerging nature and design. The expected outcomes may have changed depending on the participants, the settings, and the context in which they experienced the phenomenon (Creswell, 2007). The researcher predicted the following expected outcomes from this study:

- A greater understanding of the overall essence and meaning of the student experience and learner perspective in the use of synchronous VW simulations for applying and practicing IP teamwork skills in geographically separated healthcare students.
- Application of the essence of these experiences to future institutional planning, decision-making, and budgeting for VW use in healthcare education.
- Mitigation of logistical and technology-related issues and hurdles related to VW application for future practice and quality assurance in the use of this educational technology.
- Enhanced quality of technology-enabled learning opportunities via synchronous VWs for traditional and distance learning healthcare students.
- Decreased perception of distance between healthcare students and institutions in the province of Alberta.
- Increased socialization and understanding of one another's role in interdisciplinary healthcare student teams.

Reeves et al. (2010) describe the ultimate outcome for this study:

> When a team works "well", it does so because every member has a role. Every member not only knows and executes their own role with great skill and creativity; they also know

> the responsibilities and activities of every other role on the team, as well as having an understanding of the personal nuances that each individual brings to their role. This complicated range of elements needs to simultaneously occur if the team is to function in an effective manner. As a result, such a description tends only to cover a small number of health and social care teams. Indeed, this view represents an *ideal* type towards which teams in health and social care work. (p. 2)

Pressing forward in closing the gap between this ideal and the current state of IP healthcare teams through instructional strategies such as synchronous VW simulations for geographically separated learners was the ultimate outcome for this study. The researcher returns to these predicted outcomes in Chapter 4 (Results and Discussion) and in Chapter 5 (Conclusions and Recommendations) to assess if the data analysis provided any further insight in accomplishing these goals.

Chapter 4: Results and Discussion

Epoche

By clearing my mind as the researcher through the epoche process (Moerer-Urdahl & Creswell, 2004), I recalled my own experiences with the various components of the phenomenon in this study. Because of the length of time that I have spent in the healthcare field as both a paramedic practitioner and paramedic educator, potential bias toward interprofessional teamwork has formed in my mind. Specific beliefs, attitudes, and values have been planted and firmly rooted in my mind over the years and continue to emerge as I navigate through this epoche process and steps of reflection. I record my thoughts and feelings in the form of a journal and review them further to see if there is anything else within me that may cloud or impede my ability to see the phenomenon "for the first time" through the eyes of the participants. I attempt to identify and remove these deep, sometimes overgrown, roots of assumption and inference that have been formed from many years of experience through the steps of reflection and journaling and continue to bracket my own attitudes, beliefs, values, and experiences by setting them aside through this ongoing process throughout the data collection and data analysis phases of my research.

Three different streams of thought have emerged from the various presuppositions and preconceived notions in my reflections and meditations on the topic. These streams include (1) memories of being a young healthcare professional, (2) my own educational experience specific to IP teamwork, and (3) my perspectives on VW technologies.

As a young healthcare professional, I remember the requirement of engaging other healthcare staff from various disciplines, often feeling intimidated and inferior to their position

and role on the larger healthcare team. Other times, I felt superior to others and did not utilize these individuals and their specific skillsets, impacting the overall IP team experience for both ourselves as healthcare professionals as well as impacting the patient experience. I also recall positive experiences for both the team and patient when I did participate collaboratively with others from varying disciplines.

As a healthcare student, I recall minimal opportunities to develop my IP teamwork skills when working with other healthcare professionals and the concept of collaborative practice being largely absent in my formal educational experience. I recall that it was an expectation to practice and gain this experience through trial and error and an expectation to simply "fit in" with other team members in real clinical settings, often feeling like a "fish out of water" and "in the way." I recollect not knowing where to even stand, let alone how to communicate and engage other team members during an acute, critical patient event. These feelings dissipated with time and further experience, but not before I had made several errors as a team member resulting in less than optimal team function and potentially unsafe patient care.

My experience with synchronous, avatar-based VW simulations have been minimal to date and have often wondered about the potential for such an instructional tool to meet the needs of geographically-separated healthcare students to allow them to further hone and practice IP teamwork skills. As the researcher, I have had several IP education experiences in face-to-face simulation settings and have seen the potential for teaching soft skills such as teamwork in a simulation context. Having been a distance learning student at various times in my lifelong learning journey, I recall wishing for a solution that would meet the needs for healthcare students who do not readily have access to face-to-face simulations with other IP team members that they would inevitably need to work with in teams upon graduation. I admittedly have had past

skepticism and two negative experiences with VW simulations due to some of the limitations and lack of realism that was present at the time. These thoughts keep moving back and forth in my memories related to the phenomenon. All of these reflections have once again emerged from completing the epoche process and have begun to bring closure to my own assumptions and experiences. I need to "put aside" these thoughts, feelings, and memories to allow for an open-mindedness, opportunity for a fresh perspective, and better understanding of the meaning of the experiences of the participants engaged with the phenomenon in this study. Through this epoche process and bracketing of the participants and phenomenon, I once again exclude and attempt to disconnect from all of these swirling thoughts in my own mind and have created a readiness as the researcher to explore and complete the data collection and analysis with "fresh eyes and ears", hoping to transcend my own limited knowledge and understanding of the meaning of the lived experience with this phenomenon. The epoche process above was repeated several times until I felt a sense of closure and approached a state of receptiveness which allowed the researcher to fully concentrate and focus on what the ten participants communicated regarding their lived experiences, without coloring their story with my own thoughts, feelings, judgments, and inferences (Moerer-Urdahl & Creswell, 2004). The pursuit of freedom from presuppositions and abstaining or "staying away" from them was attempted through the continuous exercise of the epoche process throughout this study (Moustakas, 1994).

After completing the epoche, I bracketed the phenomenon "which is the residual of what remains of the natural world" (Moustakas, 1994, p. 78). The exploration and analysis of the phenomenon and the lived experiences of the participants within these brackets is further described below.

Significant Statements and Formulated Meanings

From the three focus groups (10 participants), 154 significant statements were extracted as part of the process of horizonalization. Table 2 below includes a few examples of these statements and their formulated meanings as well as how they were documented as part of the coding process. Each of the invariant horizons were coded and clustered into themes and sub-themes. Figure 3 includes the final thematic map without the invariant formulated meanings which provided the structure to write the thematic analysis and narrative of the results. A complete thematic map including the abbreviated formulated meanings for each of the themes and sub-themes can be found in the appendix.

Table 2

Example of significant statements (data extracts) and formulated meanings from the data transcripts and their associated line numbers, page, and initial assigned codes.

Transcript Number	Lines	Page	SS	Significant Statement (SS)	Formulated meaning	Code
1	3-8	1	1	Jane: I guess as an overall from my general experience, I thought it was great to work with other healthcare professionals who had different levels of knowledge, cause as for me, I am sort of starting out as a student and don't know a lot. So, it was nice to be able to learn from other healthcare professionals and see their perspective of things and how they handle situations so that if I were ever put in that same situation later on, then I have a better idea of how it	Novice student appreciated the gains of experiential learning from participating with peers with varying levels of knowledge and observing how others handled situations which can be transferred to the real world.	2 3 9

				would be a good way to handle those situations.		
2	234-236	8	77	Lisa: You can hear them which is that closeness so you're actually in the world exactly like Irene said so that is why you feel like you have got those other people there with you and it is real voices.	Real voices/verbal communication enhances realism and perceived closeness and presence in VW sim.	7 11 14
3	232-234	7	122	Jon: Subgroups. So as a leader, I can`t say – Diane and I are lead, you`re in charge of this because they can`t collaborate as a subgroup, they can only collaborate with the whole and in a large room, that would be beneficial. That is because of the one person talking at a time thing.	VW sim does not allow for subgroup collaboration in the same room via verbal communication.	7 6
3	351-354	11	132	Diane: There'd definitely have to be like an individual tutorial if you were going to implement this a little bit more widely. There would have to be definitely like an individual tutorial to go through all the stuff and have it, maybe computer guided, where they actually have to click through all the things.	Comprehensive training and orientation to the VW as a self-directed learning activity is required prior to deployment and formal use.	5
2	384-388	12	88	Lisa: So, being thrown into a situation and not really knowing your team members, having you know a member, for example – the doctor that was a little bit, not really with the whole treatment plan and having you know our team pull together for patient safety and being an IP team in that we had to, there were things that needed to be done in that timely manner. So those kind of aspects help to promote learning and practicing teamwork.	Realistic clinical context with sufficient levels of complexity, conflict, and stress promotes learning and practice of IP teamwork skills in VW sim.	1 2 12 9

1	323-326	10	41	Jane: I would agree that feedback on what was done is definitely important, otherwise, as a learning experience goes, you never really know what you did wrong or what you could have done better. So hearing that perspective of feedback from both the patient and whoever's playing the patient in addition to the other healthcare members was great.	Feedback (via debriefing) from the patient and team members in the VW was perceived as a great learning experience.	1 15

Theme 1: Curricular Integration Considerations
1.1: An Experiential Learning Tool
1.2: Face-to-Face vs. VW Simulations
1.3: Prior Learning and Experience
Theme 2: Orientation and Preparation Requirements
2.1: Orientation to One Another
2.2: Orientation to Simulation as an Instructional Method
2.3: Training and Orientation to VW Interface
Theme 3: VW Technology…Capabilities and Constraints for IP Teamwork Practice
3.1: Verbal and Non-Verbal Communication
3.1.a: Strengths and Opportunities
3.1.b: Weaknesses and Limitations
3.2: Realism and Authenticity of IP Teamwork in VW Sim
3.2.a: Physical Attributes and Presence
3.2.b: Clinical Context…True to Life
3.2.c: Clinical Skills and Tasks
3.3: Other VW Technology and Interface Experiences
Theme 4: Achievement of Positive IP Teamwork Learning and Practice
4.1: IP Socialization
4.2: A Safe and Motivating Place to Practice IP Teamwork
4.3: Evidence of IP Teamwork Learning and Skill Development

Figure 3. Final thematic map including four overarching themes and their associated sub-themes.

Thematic Analysis as Textural Description

The thematic analysis below is a "knitting together" of the various thematic horizons and related statements of the experiences that have emerged from the phenomenological reduction method used in this portion of the data analysis, representing the integration of the participants experiences (Conklin, 2007). This inductive thematic analysis will fulfill the role of an exhaustive textural description of the invariant constituents of the experience described by the participants and the researchers' conscious understanding and self-evidence of these horizons regarding the phenomenon of practicing IP teamwork in a VW simulation as geographically separated healthcare students. Moustakas (1994) argues that "nothing is omitted in the textural description of an experience; every phase and dimension is included and given equal attention" (p. 78). The textural description below represents the "what" of the experience described by the ten participants as co-researchers from the three focus groups interviewed during data collection.

What did the participants experience as geographically separated healthcare students practicing IP teamwork in a VW simulation? Four over-arching themes and several sub-themes emerged from the data extracts. These themes will be further described as an exhaustive textural description including any thoughts, feelings, issues, and struggles, capturing the nature and focus of the experience (Moustakas, 1994).

Theme 1: Curricular integration considerations. Several horizons emerged from the data that described and pointed toward several considerations for the use and integration of VW simulations in healthcare curricula for the purpose of practicing IP teamwork skills. Three sub-theme clusters provide structure to this first theme of Curricular Integration Considerations which include (1.1) An Experiential Learning Tool, (1.2) Face-to-Face Versus VW Simulations, and (1.3) Prior Learning and Experience.

Theme 1.1: An experiential learning tool. Several of the participants described their experience in the VW simulation as one that provides an opportunity for experiential learning as healthcare students. The VW simulation identified and closed various knowledge and experiential learning gaps in the participants through observation of other team member actions in the unfolding clinical context in the simulation. Opportunities for self-reflection occurred through these observations and creation of new mental models and schemata formed for future reference in similar situations. Jane further describes her experience, "The confrontation of Conrad talking to Dr. Jones I think was great because for me, I don't know how I would have handled it in real life, so to see how it was handled well is great, so that if I were to encounter that situation, then I know how to approach that."

Several participants describe their experience as one that increases their preparedness for future situations where they will need to work with unfamiliar team members. Irene, as one of the participants, states the following:

> I think it does kind of simulate how it is going to be out in the work field, like because you get thrown into situations where you don't know everyone and you'd have to figure out how to communicate with all the different people, kind of strangers, and stuff like that. I think it's a good tool to kind of get yourself prepared a little bit and see how well you perform when you get stuck in situations where you don't know anyone and you're not familiar with the staff.

Irene's description of having to work with unknown team members is significant as it describes the VW simulation as a tool that expedites experience through the practice of IP teamwork skills in a context which exists each day in healthcare settings.

A related experience for other participants was one of feeling a reduction of stress and increased confidence from the gained experience from the VW simulation, once again, feeling more prepared to work as an IP team in the future. Lisa describes her experience:

> Lisa: In the real world, how you become – how you learn, is by doing and by experience and I realize that now as I continue to get more experience out in the field – it's like "Oh, I've done this before" – OK, well I don't feel so nervous, my heart rate is not up 125 right now, like it's going to be OK; we got through it last time – you know, it is all about experiences, and I think this will help somewhat with having that type of experience and not being so nervous going into a new or similar situation.

Other participants describe the opportunity of experiencing a realistic clinical context in the VW simulation before their internships or clinical practicum. Previous didactic learning of IP teamwork and effective communication skills are authentically "brought to life" in the VW simulation, having to work with other healthcare disciplines, something that usually does not occur until the real patient care setting. Irene describes her perception below:

> Irene: I feel like because you mixed different professions in this world, it was a good learning experience to kind of see what other professions are capable of – their scope of practice kind of thing because when you're in a faculty, you're just kind of focused on your own, right. You do learn about effective communication within your IP teamwork course kind of thing, but you don't really get a sense of it unless you're put into it and that's only when like clinicals' come around. So if you have this simulation simultaneously within the learning program or what not…
>
> Researcher (R): …prior to practice.

Irene: …yeah, then I think it would help build, I guess, your skill set.

Irene, along with other participants continued to describe "skill-sets" as being gained experience, becoming further "tools in their tool belt" for future patient care.

Susan describes a similar experience related to the potential for expediting experiential learning via the VW simulation context prior to real patient care in the hospital:

Susan: Only have about one month experience in the hospital, this is definitely good as like an 'icebreaker' to transfer when going into the hospital.

R: Taking your experiences….

Susan: …from school, putting them into the simulation and from simulation to….

R: …going to practicum. So the VW SIM is a great bridge.

Susan: Yeah.

This opportunity of connecting didactic and practicum education with the "bridge of the VW simulation" is significant and perceived as another expedited and enhanced experiential learning moment gained from this phenomenon, providing early exposure to various pre-determined simulated clinical encounters for developing the "skillset" of IP teamwork and "taking your experiences" with you to the real patient care setting.

The integration of a VW simulation experience in the curricula for the purpose of experiential learning and practice is cautioned by participants that a "one time" experience is not sufficient to achieve competency in IP teamwork skills. Although the phenomenon resulted in greater awareness of the importance of IP teamwork and initial experiential gains, Susan, along

with others recommend that "you would have to practice a skill over a length of time…" and that the VW simulation should be repeated and offered more than once in the curriculum. Irene, another participant, shows curiosity and a desire "to test, if we were to do it again as a group, if that would change anything with our progress…" suggesting further practice and application in the form of experiential learning opportunities in the curriculum.

Theme 1.2: Face-to-face vs. VW simulations. Several participants naturally compared and contrasted their previous experiences with face-to-face simulations and the VW simulation. The meanings of these experiences contribute to a better understanding of the optimal curricular integration of VW simulations and their relationship with more traditional forms of face-to-face simulations such as the use of mannequins and simulated (or standardized) patients in a simulation center or lab setting. Several participants described the phenomenon to be very similar to face-to-face simulations for the purpose of learning and practicing IP teamwork. In fact, a few students felt that VW simulations could potentially replicate and replace face-to-face simulation learning events and scenarios that focus on IP teamwork and collaborative practice. VW simulations were perceived and described as being "easier to coordinate than previous IP education experiences that were large, one-day events, offering face-to-face simulation experiences." Use of "time-out/time-in's" were described as being successful in the VW simulation context just the same as face-to-face environments.

Learner engagement in the debriefing portion of the simulation for feedback purposes is described as being very similar in both settings. Yet, a few participants felt that debriefing and providing mutual feedback is more authentic and effective in the face-to-face setting because of the ability to read non-verbal cues such as eye contact and body language. Even so, these same participants described their debriefing and feedback experiences to be effective and successful in

the VW, especially for their first experience in this context. Sara, Jon, and James, discuss this concept further:

> Sara: Yep. But on a positive note, it was good that we were able to be completely honest with our experience (in the debriefing).
>
> R: So tell me, did you feel safe by being completely honest and others being honest with you in that environment.
>
> Sara: Yes.
>
> Jon: It still worked even though we were geographically separated.
>
> R: It still worked in terms of meeting the objectives.
>
> James: Like Jon was saying, I think limitations aside, we still did discuss quite a few good things in the VW and for the first debriefing, it works…just as not effectively as in person, but we still did debrief effectively.

One can feel the tension in James' words as he still preferred previous face-to-face debriefing yet experienced "effective" debriefing in the VW simulation phenomenon.

Other participants describe a similar closeness to others in both VW and face-to-face simulations. Leona describes this experience, "I guess it has to do with the safety of it (VW). So feeling… I have taken part in simulation labs that are real like when you do it in real life, so it actually felt quite similar to that experience for me, in terms of the closeness to the other students and their roles as well." Leona states "at this point in my education," she is more comfortable in

the VW simulation compared to previous face-to-face simulation experiences which was echoed by other participants as well.

Virtual simulations are perceived by some participants to be a useful introductory tool that should be used early in the curriculum which allows time for mental processing, slower decision-making and a less stressful learning experience compared to face-to-face simulations. Conrad describes his experience with the phenomenon as "a good kind of initiation…like to kind of start off and kind of build, I guess, those muscle memories or I guess it is more communication memories than anything…yeah…cognitive memory…in face-to-face simulations, you feel a bit rushed and your adrenalin spikes a lot more than in a VW…" Jane, another participant, describes a similar experience where she feels that VW simulations, which are less realistic and authentic, should be introduced before face-to-face simulations to avoid the comparison and longing for face-to-face elements that cannot be replicated in the VW:

> I feel like if you did the face-to-face in real world scenario first and then switched over to virtual. I feel like once you went over the virtual, you'd feel more like you were missing something versus if you did it the other way around. Just because you have had that experience of being in the same room with everyone, working with them, seeing how they work, seeing their body language, and how they interact with a patient. I feel like you would miss it more once you didn't have it.

Although other participants agreed with Jane above, they also felt that students would find value in both face-to-face and VW simulations running concurrently in curricula to complement each modes strengths and weaknesses. Conrad states, "I think it'd be a big asset to have both of them

(face-to-face simulations and VW simulations) kind of working at the same time because then you kind of are coming at it from two angles…"

Some participants experienced the desire for a greater emphasis on the "hard skills" in the phenomenon such as clinical tasks but recognize the balance, purpose, and focus of soft skills for the VW medium. Lisa feels that the phenomenon is more of a teamwork soft skills simulation, "definitely more of a talking and listening type of thing…I think if we were to do more skills in the simulation, I might actually get confused like if I am simulating doing things on the computer versus actually doing it." Susan adds to Lisa's experience by recognizing that it would "take a lot longer to do the VW simulations" if clinical skills were expected to be completed in a more realistic fashion. The participants agree on the value for VW simulations to focus on cognitive and affective domains of learning in contrast to face-to-face simulations which have the potential and ability to do the same with the added focus of psychomotor, clinical skill practice.

Another interesting experience by a participant echoed by others is the perception of less bias and judgment of one another as avatars in the VW simulation compared to face-to-face simulations. Lisa describes this experience further:

> Lisa: We have, I find unfortunately, in real life, we stereotype or we just kind of have biases with certain people and just even by looking at someone, you already have stuff going on in your brain. So if you are sitting in the VW and you have got this avatar and it looks nothing like you, then I think you can't really have those biases right. Whether it be a male or female biases, that is a different story, but there is…you know, you leave that out the VW which is nice too, right.
>
> R: So you can't bias or judge one another as readily

Lisa: Yep

Theme 1.3: Prior learning and experience. Several participants describe the impact of their current level of clinical knowledge and training as well as prior learning of IP teamwork concepts in the curriculum on the phenomenon. Previous practical experience with IP teamwork in the clinical setting was also described as having an impact on their experience with the VW phenomenon. Jane, who describes herself as a novice student who does not yet "know a lot", appreciated the gains of learning from other team members with varying levels of knowledge and the opportunity to observe how others managed the situation resulting in a feeling of better preparedness and transferability to future clinical situations in her own practice. Jane describes this experience in her own words,

> I thought it was great to work with other healthcare professionals who had different levels of knowledge, cause as for me, I am sort of starting out as a student and don't know a lot. So, it was nice to be able to learn from other healthcare professionals and see their perspective of things and how they handle situations so that if I were ever put in that same situation later on, then I have a better idea of how it would be a good way to handle those situations.

The level of the learner and perception of not knowing as much as the others does not appear to diminish the impact of the phenomenon for this participant. Another participant, Leona, describes a similar experience of feeling inadequate and intimidated due to being at a lower level than other students on the team but resolves these feelings through a continued desire to learn from the other disciplines on the team, a perception of approachability toward other disciplines

for support even greater than the peers in her own profession, and a sense of the VW simulation context to be safe for this learning to occur. Leona reflects her experience in her own words:

> Leona: I would agree with Jane that it is really nice to learn from other people. It is easy to get carried away with sort of feeling inadequate because you're somewhere in the middle of your studies and not at the end, but I guess it also … we're always learning, right, even when we graduate so…
>
> R: So at different levels of training, you found a little inadequate depending at what levels… what continuum you are on
>
> Leona: Yeah. So I like haven't done IVs yet, so I understand the theories behind them and I have been around them and I've monitored them, but I haven't actually – I'm not allowed to, in my practice, to use them. But, so in order to learn it a little bit just from watching people do it and be in that atmosphere, it does feel safe, and I think I'm surrounded by nurses all the time at school, so it's nice to again, yes, be around people of other disciplines because it becomes less intimidating and I feel a little more like I can talk to them later.
>
> R: Equal levels of training then would work better for you, you think, if all of you were say senior students or recent grads working to your fullest scope and junior students perhaps working all together with other junior students… or what are your thoughts around that then? Just expand to your comment.

> Leona: I think initially that's what I thought and then as we went along, as Jane said, it felt like actually a benefit to be with people of different levels because it sort of helped me to see where I would be going in the future.

Another participant describes his support for different levels of training and experience when practicing IP teamwork as it replicates real life situations and promotes learning and growth for everyone. Conrad states,

> And to kind of comment on Leona's, with different levels of training, I think it's a good thing because when you get out into practice, there will be people that are at different levels everywhere. Like I remember in my ICU, there is like a first-year med student that was just kind of hanging out, just kind of shadowing, and he kind of got thrown into the mix because we didn't have any other sets of hands, so we were just telling him what to do…I don't know… just different levels of experience and things that just helps everybody and everyone can kind of progress from it.

Thus, any potential negative impact of learning together at different levels of knowledge and experience appear to be nominal; in fact, several participants report a positive result of learning from their respective team members represented by other disciplines at various levels of training and a greater ability to perceive their role on an IP team for the future.

In contrast, some participants communicated a decreased impact or perceived value of the phenomenon due to previous IP teamwork training and clinical work experience. These participants describe a greater value and benefit of the VW simulation for novice students who have not yet experienced IP teamwork learning in the curricula or in practice. Conrad shares his experiences:

> Since I have done some interdisciplinary training, my mindsets have already shifted, so it hasn't really changed that much, but I think people that haven't done it, would benefit a lot from it cause I know just doing that Save Stan event, my whole thought processes have changed.

Conrad describes his own transformational change and perceived value and importance of IP teamwork occurring at a prior face-to-face training event called Save Stan Saturday. He predicts the same potential benefit and similar transformational change with the VW phenomenon for those who have no previous teamwork practice, training, or experiences. Conrad states, "…getting people in there (VW) that have never done any interdisciplinary training would benefit a lot." Other participants contrast and affirm that experienced healthcare students may still find value and opportunity to practice in the VW simulation; however, novice students with no previous IP teamwork experience or training would still find the greatest value from the phenomenon.

Several of the participants with previous IP work experience still appreciated the value and added practice opportunity of the VW simulation but found that the phenomenon did not change their views on the importance of IP teamwork; rather, it was found to reinforce their IP teamwork skill-sets and affirm their past experiences in a positive manner. Jane describes a continued positive outlook on IP teamwork following the phenomenon stating, "I always thought IP work was very important and I always really liked working with other healthcare professionals and I don't think that the simulation has changed that at all, which is probably a good thing." Many of the participants still experienced opportunity to practice teamwork and obtained new growth and learning from the VW simulation experience. Lisa, one of the more experienced participants in the study, summarizes this perspective below:

> It made me aware of a lot of things I still have to learn about my team members in the healthcare realm. I don't know very much about what an RT does or what an RN does and I appreciate their roles more. I did learn a lot today and you know, it just kind of gives you a better insight into what exactly is going on. There is so many other things that you don't know about and you should not just assume things. I might have a little bit more patience in future experiences.

Considering prior learning and experience when selecting the clinical context and scenario is also described as an important factor and having a potential for limited and sub-optimal learning and teamwork practice in the VW simulation. Jane describes her experience of lacking pre-requisite knowledge for the VW simulation and the consequence of not taking leadership as part of her role on the IP team:

> I was going to say the choice of what scenario you choose, you can effect it as well. From like my perspective, for the medical students, we do slow in-class learning and lecture-based learning for the first two years and then everything clinical the last two years. So depending on what clinical scenario you choose to present, we might not know what to do because we haven't seen that clinical aspect of it yet, and so for me, I didn't know what Atropine did because we never covered that side of things, so I didn't know you had to administer that so I wouldn't take charge in that kind of scenario because I've just never seen it.

Interestingly, another participant challenged Jane during the focus group interview, asking if she had still learned anything as a result of her experience above, which resulted in a resounding "Yes!" related to new clinical knowledge as well as greater understanding of the need to rely on

your IP team when not familiar with the presenting clinical presentation of the patient. Nevertheless, appropriate selection and creation of the clinical context and scenario based on prior learning and experience in the student audience is perceived to be important for optimal learning and practice of IP teamwork competencies in the VW simulation. The three sub-themes above and their associated examples of evidence from the data support this first over-arching theme of Curricular Integration Considerations.

Theme 2: Orientation and preparation requirements. Several of the significant statements and invariant horizons that emerged from the participants descriptions culminated into an overarching theme related to Orientation and Preparation Requirements prior to experiencing the phenomenon. Three sub-themes provide further structure to this theme, namely, (2.1) Orientation to One Another, (2.2) Orientation to Simulation as an Instructional Method, and (2.3) Training and Orientation to the VW Interface.

Theme 2.1: Orientation to one another. Any descriptions of experiences in the data related to the need or desire for orientation to one another's roles, disciplines, and level of training prior to the VW simulation were clustered into this theme. Irene, one of the participants, states, "I feel like just because we kind of lacked that knowledge on what each profession does, that impacted our experience." Other participants echoed a similar desire to have a better understanding and "briefing" of one another's current level of training and scope of practice including what they can and cannot do as clinicians. Leona confirms this experience:

> Leona: I feel like because my scope is fairly limited still at this part of my education that it would have been helpful sometime before the simulation started to sort of make people

aware of what I can do in the real world and what I can't do. Because we can all do whatever we want to in a VW –but to make it more realistic, I think that would help.

R: What you can and cannot do at this stage of your learning or as a nurse in general.

Leona: No, at the stage in my learning because there are many things that I haven't learned yet, but I will know how to do when I'm finished my training.

Jane also describes her experience in the VW simulation as less comfortable than previous face-to-face IPE and simulation experiences when it comes to working with other people due to a lack of orientation, "ice-breakers", and relationship-building with her team members prior to experiencing the phenomenon. She states that her face-to-face experience may have been preferred because "we met them all first and got to do small activities first before we actually got put in the scenarios so we knew who we were dealing with, we knew each other, we talked to each other before – that might have been it".

In contrast, other participants described the phenomenon as a sufficient amount of introductions to one another within the VW with no need for any face-to-face exercises and team-building prior to. Several people experienced the phenomenon as a very realistic situation where "you get thrown into situations where you don't know everyone and you have to figure out how to communicate with all the different people, kind of strangers." Irene, describes the VW simulation as "a good tool to get yourself prepared and see how well you perform when you get stuck in situations where you don't know anyone and you're not familiar with the staff." Thus, a tension exists between some participants who desire a richer, more in-depth orientation to one another compared to those that want an experience of having to work with other students as healthcare professionals that they know little about, simulating real healthcare situations and

systems. Nevertheless, an orientation to one another in the VW is perceived to have value for healthcare students who will be participating in IP teamwork learning and practice activities.

Theme 2.2: Orientation to simulation as an instructional method. This sub-theme contains clusters of significant statements and evidence that described meanings related to the need for training and orientation on general concepts of simulation as an instructional method prior to introducing the phenomenon. Several participants used the words "unrealistic" or "lacking realism" to describe their experience often having an expectation to be able to replicate everything and anything in the VW environment. This unrealistic expectation was described as a potential symptom and result of a lack of clear understanding of what simulations can and cannot do as well as how one must "behave" as participants during simulation events. Sara, one of the participants, describes the inability to "suspend disbelief" regarding her perception of the instructor (researcher) role-playing a nursing assistant in the VW simulation:

> Sara: Sometimes I had a hard time knowing that it's not "you" the researcher but the nursing assistant, so essentially I was a bit frustrated with that.
>
> R: Because you saw me as the instructor?
>
> Sara: I did.

Other participants describe a desire and solution of a brief orientation specific to simulation methodology and the expectations and roles of students and instructors to "play the game" of simulations. Understanding role-play and the need for "buy-in" and the ability to "imagine" the instructor and others as another character or person in the VW is also described by participants as necessary to optimize simulation-based education methods.

For other participants, the VW simulation was described as immersive, mimicking real behaviors, normal interaction, and perception of others without the need for any additional orientation and training that was provided. James states, "I think it is probably unique to our generation and going on into the future, but I found that buying into this scenario, buying into the virtual environment, was fairly easy after a little while… I found myself actually interacting with them on more of a normal basis…like facing them when I was talking to them." Nevertheless, further orientation to general concepts of simulation-based learning was found to be a significant extract from the data to better understand the meaning and nature of the experience with the phenomenon.

Theme 2.3: Training and orientation to the VW interface. This third sub-theme contains evidence of patterns in the data and clusters of significant statements and descriptions of participants experiences related to the need for training and orientation to the VW technology and interface prior to introducing the phenomenon. Participants describe varying experiences related to competency and self-efficacy with the technology interface. Feelings of cognitive overload and lack of comfort are expressed by some participants regardless of the initial orientation and pre-reading provided as part of the study. Participants described a desire for more "hands-on" practice and time for familiarity in the VW prior to participating in the phenomenon. Irene states,

> Irene: I feel like maybe if we had time to access the program earlier and maybe fiddle around… I don't know, fiddle around with like the equipment, where to find things, and then when you go into a situation like that, you would know where to get stuff and it would just be a lot smoother.

R: So when sending out the email with the cheat sheet and a video – did you find that was helpful or you just didn't get a chance to view it before the event.

Irene: I viewed it except I'm the type of person that needs to do it…

R: Experience it…

Irene: Yeah.

Conrad and Leona, two participants, describe their related experience below:

Conrad: The lack of knowledge of how to do things (in the VW) really affected how I was able to assess. If I would have had like a test-run or a few test-runs, I think things would have gone a lot smoother.

R: So prior practice and more orientation?

Conrad: Yes (prior practice). Yeah it is hard to – like you did a great job orientating, but it'd be nice to do like a practice run and do one afterwards, then things come up for sure while you are doing it.

Leona: I also found like – such as "how do I administer the medication?" - - sort of having trouble, sort of having trouble sort of adjusting to the menus - - so again, yeah, I think some practice rounds might have made that a little smoother and might have made it feel more natural.

Others described the need for practice to achieve "a level of skill that might be necessary in order to communicate that way" and a need to practice "with those movements, because it felt awkward moving….like sort of like a robot." Another participant described his experience as "a

lot there that you could do…I would be clicking things…..I could do that, that, and that…a bit of overload for me." Other descriptions included "I just didn't have enough time to get comfortable with what was there…", "it was a little bit-trying to get used to the computer, simulation, and how to move and like where you look and stuff and how to click and find all of your tools…a bit of a challenge for me." Jane shares her experience:

> I knew what I wanted to do, but I spent time trying to figure out how to do it. I would click through the buttons on there thinking OK, maybe this is how I do it – but nope, it's not on there and would go search another screen…I think definitely the flow is going to be better once you get familiar with the buttons and what to do.

Other participants suggested the need for comprehensive training and orientation prior to formal deployment of this type of phenomenon in curricula; Diane suggests "an individual tutorial if you were going to implement this a bit more widely…like a tutorial to go through all the stuff…maybe computer-guided…where they actually have to click through all the things." Increased opportunity and time for practice in the VW simulation prior to practicing IP teamwork was perceived as increasing comfort levels with, and reducing any feelings of cognitive overload from the technology and its interface; thus, an important sub-theme of this second over-arching theme of Orientation and Preparation Requirements found in the data extracts.

Theme 3: VW technology-capabilities and constraints for IP teamwork practice.

This third over-arching theme emerged during the coding process while clustering the significant statements and horizons into meaning units and themes. All of the participants described several common as well as a few differing experiences with the VW technology interface. This broad

theme includes several sub-themes to provide further structure, meaning, and understanding of the participants experience with this phenomenon. The sub-themes include (3.1) Verbal and Non-Verbal Communication, (3.2) Realism and Authenticity of IP Teamwork, and (3.3) Other Technology and Interface Experiences.

Theme 3.1: Verbal and non-verbal communication. In this sub-theme, students described their experiences with both verbal and non-verbal communication capabilities and constraints within the VW simulation. Horizonal statements that reflected common issues and general experiences with verbal and non-verbal communication while practicing IP teamwork in the VW simulation were clustered into this sub-theme. Two further sub-themes emerged from the data specific to Verbal and Non-Verbal Communication, namely, (3.1.a) Strengths and Opportunities, as well as (3.1.b) Weaknesses and Limitations.

Theme 3.1.a: Strengths and opportunities. Several participants described the synchronous audio as "working well" and an effective and valuable tool in accomplishing what needed to be done in the VW simulation. Others added their positive findings and preference for verbal communication and not the text/chat feature from their experiences. James shares his experience,

> James: Except for lack of more than one person to talk at the same time, the real-time communication moving verbally back and forth was good. It is nice not to have to type in everything and chat in that fashion, being able to verbally communicate still did convey a lot of information in a short amount of time.

Because of the perceived limitation of non-verbal communication and only one person being able to speak at any one time, participants described practicing and depending on "the value of

closed-loop communication especially in this virtual environment", a cornerstone teamwork communication skill which ironically was "over-practiced" due to this perceived obstacle.

Participants also described the verbal communication technology in the VW to be realistic specific to the need for communication updates and listening skills when entering and leaving each room or space in the VW. Lisa explains her experience,

Lisa: I think it was pretty good in that when I went out to go get meds, I didn't have any idea what was going on so I had to get an update every time I went into the room.

R: Just like in real life.

Lisa: Yeah.

R: …if you leave the room you wouldn't still hear the conversation

Lisa: Yeah

R: …but was it too noisy for when you had four people talking at once.

Lisa: Well it made you listen, it made you sit back, and say yeah OK, I need to be quiet now and listen. But I guess like when Susan talked about with the lung sounds.

R: So it did in fact promote good listening skills in that sense.

Lisa: Yes

Verbal communication was also described as "making up for other less realistic elements" of the VW technology. James states, "Clicking through menus to do an assessment didn't feel real to me, it didn't feel immersive – that part took me out of the SIM a little bit. But

every time that we would start a conversation or a discussion about something, I'd get pulled back in a little bit."

An opportunity recognized by all of the participants was to be able to view one another as avatars during the debriefing of the VW simulation as they were unable to do so due to the pop-up window with learning objectives covering all of the avatars. One person stated, "I don't know why, but I was trying to look at them when they were talking." This desire to see the non-verbal cues and physical presence of one another was expressed throughout the focus group interviews as a common experience and opportunity for further development and growth of the current technology. One person described the potential use of a live video chat tool during debriefing in the VW as an opportunity for a "more effective way of communication where you can read a lot more from the person when you see them talking and not just looking at the avatar that doesn't move or have facial expressions…" filling the perceived gap of missing non-verbal cues.

Theme 3.1.b: Weaknesses and limitations. Weaknesses and limitations of verbal and non-verbal communication were also described by all of the participants as a constraint of the VW technology. The verbal communication was described as "talking over one another", "stepping on each other's toes", "trouble initiating who was going to talk first", "pausing to see if someone has something to say", "difficult to get a lot of information around the room and only one person could speak", and "like a room of screaming kids." Several participants described a desire to be able to have "subgroup" conversations within the same room in the VW which they were not able to do with the current technology. Jon states,

> Subgroups. So as a leader, I can`t say – Diane and I are lead, you`re in charge of this because they can`t collaborate as a subgroup, they can only collaborate with the whole

> and in a large room…that would be beneficial. That is because of the one person talking at a time thing.

This weakness in the technology was described as a limitation and having a negative impact on practicing effective IP teamwork skills such as leadership, authentic verbal communication skills, and collaboration.

Excessive verbal noise was also experienced by many of the participants resulting in overuse of the electronic medical record for vital signs recording and a negative behavior of not verbally communicating the pertinent physiological findings to their team members for the sake of reducing noise levels; thus, a potential weakness and limitation of the VW technology for promoting and practicing safe and appropriate IP teamwork including verbal communication when required in an acute care setting.

The non-verbal communication was often described with words and phrases such as "I can't see who is talking", "no body language or gestures", and "missing eye contact, smells, and other non-verbal abilities to communicate." A few students described the inability to "touch the patient on the arm" and other small physical movements and forms of non-verbal communication which they felt ought to be practiced to promote patient-centered care. One participant emphatically emphasized and restated his experiences, "just how important, vitally important non-verbal communication becomes and observational skills. Like seeing from across the room that Diane is taking vitals, so it doesn't need to be verbalized." Leona describes a similar experience of excessive verbal dependency in the VW simulation due to a lack of non-verbal communication, limiting IP teamwork practice:

Leona: I really, from my clinical experience, the part that I missed was eye contact and smells and sort of the nonverbal ability to communicate.

R: Nonverbal communication – you missed it?

Leona: I did, yes.

R: So you didn't like when your hands went up and down when you talked?

Leona: Well I felt a couple times like I started talking and Melisa started talking and that if we were in the same room and we could have made eye contact, that I wouldn't have been talking over her or vice versa so much.

Two participants describe their experience with wanting to communicate non-verbally by "nodding" their heads and realizing that no one can see them nodding in the VW, leaving them wondering, "how am I going to make people know that I'm nodding-that I'm in agreement…and then realize that I have to talk." This described gap of non-verbal modes of communication created unrealistic interaction and unnecessary dialogue on the IP team; another perceived weakness and limitation with a potential negative outcome of incorrect practice of teamwork such as promotion of poor communication skills and habits in the VW simulation.

Diane describes a similar experience of not being able to non-verbally communicate and how this changes how she can gather vital information from other team members, including the overuse and dependency of verbal communication:

Diane: The fact that there was no body language or eye contact or gestures, it really changed the dynamic of at least how I communicate or how I get information from other people in a situation. There is no…. this is happening, can you take a look at this, can you

hold this, can you come over here and help me with this – it was lot of verbal back and forth; do a thing, wait until there is a chance to say something and say it.

A few of the participants experienced microphone issues and a lack of dependability, not certain of the underlying cause of the problem. Several people described the microphone as "cutting in and out" and wondering "if there is an adjustment" or if it is a matter of simply "gaining more comfort with the whole situation." A few of the students had to hold the microphone really close to their mouth and wondering if they "weren't talking loud enough." Lisa experienced the microphone "cutting out for softer speaking individuals" during the simulation but had no problems with her own microphone, stating that her voice "is quite boisterous and am able to project it quite well." Participants with microphone problems were usually able to troubleshoot and adjust the sensitivity of their microphone settings; however, as Theme 2 suggested, further training and orientation on the technology, including the microphone, would have prevented some of these negative experiences related to intermittent breakdown of verbal communication.

James, another participant, summarized the experience with communication in the VW simulation for all of the participants, stating, "The nuances of communication that go beyond simply saying words are lost." Too much emphasis and dependency on verbal communication due to other missing forms of communication was described as a limitation of the VW technology and a limitation to authentic and optimal practice of IP teamwork skills.

Theme 3.2: Realism and authenticity of IP teamwork in the VW simulation. In this cluster, participants relayed their experiences with the technology capabilities and constraints specific to the immersion, fidelity, and authenticity of IP teamwork in the VW simulation

context. This sub-theme was further divided into three more sub-themes including the following: (3.2.a) Physical Attributes and Presence, (3.2.b) Clinical Context…True to Life, and (3.2.c) Clinical Skills and Tasks.

Theme 3.2.a: Physical attributes and presence. Patterns in the data extracts related to any experiences with the VW physical characteristics of avatars as well as "physical" presence in the VW simulation were clustered together in this meaning unit. Avatars were described as lacking sufficient amounts of non-verbal cues and gestures. Conrad states, "I mean like body positions, the look on people's faces too, you can really read a lot, so you can't really get that with the computer dude." Others described their experience related to physical attributes as "fun" while some found it motivating, although not necessary, if they would be able to create an avatar that looked like them. Diane shared her comfort levels with avatars: "I'm pretty used to playing video games where the character I'm playing looks absolutely nothing like me. I mean it is fun when you can kind of make something that looks like you sometimes, but it's really not the important part." Physical attributes that were described as important were discipline-specific uniforms or clothing that were sufficiently distinct to distinguish between team members and "role identity" while practicing and functioning as a team in the VW (see Figure 4 below). One of the participants summarizes this need from his experiences:

> I did find myself looking around the room for the characters and how they looked. If I wanted to find Jon, I would look for the other person dressed like a paramedic in the room, and if I wanted to find Diane, I would look for the person dressed like an RT in the room… So, yeah to a point, I think it is pretty important.

As mentioned in Theme 1.2, Face-to-Face Simulations vs. VW Simulations, some students experienced less bias and judging of one another as avatars compared to real face-to-face settings.

Figure 4. Note the various avatars and their associated uniforms related to their healthcare discipline; this physical attribute in the VW simulation was perceived as advantageous by the participants.

Participants also described their experiences with their physical presence in the VW simulation. Some "felt surprisingly close to the other students" and had no sense of "how close or how far they were" from them. Irene states, "I felt like we were actually a team in that room…like we were all in that room together." James experienced the ability to be immersed into the VW simulation and "buying-in" to the physical attributes and presence, thus enhancing the realism and authenticity of the phenomenon:

> I found myself when the physician came into the room, actually turning my avatar to face the physician when I was speaking to him or just looking for the others in the room and instead of looking for their names above their head. I was just looking for what they looked like. So when I wanted to see where Diane was and what she was doing, I would just look for her avatar or where Jon's was and then I would just accept that as where he was in the room at the time…I was very aware of where everyone was in the room and I found myself actually interacting with them on more of a normal basis like I said, like facing them when I was talking to them.

Lisa adds to this experience by suggesting, "You can hear them which is that closeness so you're actually in the world…so that is why you feel like you have got those people there with you…it is the real voices."

Several participants experienced frustration and confusion with the lack of requirement and accuracy for physical proximity. Students describe their ability to complete tasks and clinical procedures "while being halfway across the room" without having to be in the proper position, once again, creating confusion on the team and limiting proper practice of skills such as effective communication and delegation in IP teamwork. Diane shares her experience echoed by others:

> You didn't actually have to be at the head of the bed to be doing airway stuff; you didn't actually have to be right at the arm to be checking a pulse and I think that led to part of me stealing Sara's job a little bit because it was too easy to just click on things and be like I'm going to do this thing even though physically that's impossible to do, or I would be getting in the way of Jon doing his thing if I was doing that.

Diane's experience described a negative outcome in the perceived inability or requirement to practice the IP teamwork skills of proper physical positioning and situational awareness in the VW simulation environment.

Other participants described their intentional movement and use of their avatar for physical presence in the VW to engage the patient and other team members. Jon's excerpt shares his experience with the need for physical presence and use of:

R: Did the rest of you ever move your avatar to face someone to speak?

Jon: I moved my avatar like to the patient and talked to the patient. At one point I moved my avatar in front of the door to block the doctor from leaving (laughter). It was like I would get the last word here and just sat there in front of the door.

Sara: I did see that and I didn't know if it was intentional. He is like 'blocking the door'.

Jon: Yes, I used my avatar.

The data extract examples above illustrate some of the significant experiences with the physical attributes and presence in the VW simulation and its impact on the realism and authenticity of practicing IP teamwork within the capabilities and constraints of this technology.

Theme 3.2.b: Clinical context…true to life. This cluster of significant statements and meanings represent descriptions of experiences with the phenomenon specific to the clinical context and its relation to the level of realism and authenticity that the VW technology affords for practicing IP teamwork in this setting. Most of the participants describe their experience with the clinical context as being realistic and "true to life" with sufficient levels of complexity,

tensions, conflict, and stress that replicated an acute care patient situation, providing an unfolding clinical scenario to practice and apply IP teamwork skills as healthcare students. Lisa summarizes her experience with the clinical context below:

> So, being thrown into a situation and not really knowing your team members, having you know a member, for example – the doctor that was a little bit, not really with the whole treatment plan and having you know our team pull together for patient safety and being an IP team in that we had to, there were things that needed to be done in that timely manner. So those kind of aspects help to promote learning and practicing teamwork.

Lisa's experience described above paints a picture of a clinical context that provides tension and conflict with "the doctor" and the need for the team to "pull together" for the purpose of patient safety and conflict resolution on the team; for making decisions and completing time-sensitive tasks, and in doing so, creating an element of stress and immersion into the scenario that normally would be experienced in a real life situation.

Others experienced similar emotional reactions toward the doctor and nursing assistant (staged actors) in the clinical context. Participants described various emotions at varying degrees; examples from the data include, "the nurse assistant did make me feel bad about myself two times", "I got my hand slapped", "he was kind of rude", to "I hated Dr. Jones." Participants state that the clinical context "pulled them in" affectively and emotionally once again feeling true to life.

Several participants experienced a realistic clinical context from using live voices in the VW, creating a "sense of presence" and a feeling of "being right beside them." Others described an even greater desire for stimulation of all of their "senses" to allow further immersion into the

clinical context, although readily admitting and recognizing the limitations of the technology and difficulty in simulating all of the elements such as smells and other tactile sensations.

Some participants desired further complexity in the clinical context. One person requested multiple patients to be added in adjacent rooms in the VW to create a "ward" of patients as opposed to only one patient requiring care by the IP team, thus creating competing priorities needing to be addressed by the team. Another participant felt that the clinical context presented in the VW simulation was too easy for her and lacked a sufficient amount of related tasks for her specific role and discipline, limiting her contribution to the team. A participant that was mentioned earlier, again expressed her inability to lead as the physician in the clinical context as a result of too much complexity and a lack of pre-requisite knowledge of some of the drugs used to care for the acutely ill patient; however, the same participant was challenged by another participant, asking if she still learned something from the simulation which she then responded, 'Oh yeah…even just from like the medical side of things…yeah, I definitely did, which was great." This type of gain in clinical learning and experience was also described by others as a "value-added" experience in addition to the primary focus of practicing teamwork competencies from the VW simulation. This tension of "just the right amount" of complexity, discussed in Theme 1.3, Prior Learning and Experience, interconnects with this sub-theme and the participants desire for a realistic and relevant clinical context to their level of training to optimize IP teamwork practice opportunities in the VW.

Theme 3.2.c: Clinical skills and tasks. In this sub-theme, participants focused and reflected on their experiences with completing tasks and clinical skills in the VW simulation, merging with other essences and meanings of the phenomenon related to realism and authenticity of the technology. Although all of the participants recognized the purpose and focus of soft skills,

communication, and other IP teamwork training in the VW simulation, there was still a common experience and feeling of dissatisfaction when performing and completing clinical skills and tasks. A common experience included unrealistic and oversimplified skills and tasks, resulting in clinical and teamwork errors and practice of poor technique. Other common experiences were described as a lack of visual prompts when completing the steps in a clinical task, a lack of sufficient steps to appreciate the complexity and time required to complete the skill, a lack of tactile and other sensory stimulation found in other video game consoles and controls when doing clinical tasks, the ability to complete any task from across the room with no required "nearness" or close proximity to the equipment or patient, and as one person stated, "…clicking through menus to do an assessment didn't feel realistic." Susan provides an excerpt of her experience with clinical skills and tasks and the risk of incomplete practice of all of the steps and shortcuts taken:

> Susan: Then the procedures for like say ABGs, you just clicked on a button instead of actually doing everything and so you never really need to wash your hands or need gloves or anything like that.
>
> R: So is that why you might have forgotten the gloves because it was less task focused.
>
> Susan: Yeah because it was very less task focused.
>
> R: …So would you prefer to do more of the actual skills?
>
> Susan: Yeah, I'd say so or at least get like a – pick which one in order you have to do, sequence type thing.

Irene, another participant, describes a similar experience and also questions the technology's ability to achieve the complex requests related to enhancing clinical skill and task authenticity:

> I just kind of wasn't a big fan of the just clicking and it happens kind of thing…like an example – like if you just clicked on the gloves and then you were wearing gloves. In that sense it's just the program itself, but I don't know how feasible it would be just to make a program that you would just see. It would be like, you see the person putting on gloves or you would see the person grabbing the blood pressure cuff and putting it on – stuff like that. I know that takes a lot work…

The experiences described above paint a better picture of the perceived realism and authenticity of performing clinical skills and tasks in the VW simulation and some of the limitations of the technology in the eyes of the participants.

Theme 3.3: Other VW technology and interface improvement opportunities. Participants also had several individual experiences that did not ring true for everyone or create a pattern in the data set; however, several of the individual perceptions were found to be pertinent by the researcher in better understanding the experiences with the VW simulation technology and its capabilities and constraints for practicing IP teamwork as geographically separated healthcare students. Thus, a final sub-theme was created to consolidate all of these individual experiences that emerged from the data. Some of these pertinent findings included the following:

- *Medication requisition.* A participant described the task of acquiring the medications from the "dispenser" as too simplistic with pre-determined drugs and doses. Having the

ability to select from a comprehensive list of drugs and decide on the dose and route was perceived to be more authentic and a suggested improvement of the technology.

- *Small images*. Two participants experienced difficulty with reading the patients vital signs on the patient monitor. Conrad states, "I read the pulse as 82, not 32, but that might just be my eyes…just little minor glitches like that, that you wouldn't get in real life because you'd be actually assessing the pulse at the same time." Diane experienced difficulty with reading the electrocardiogram (ECG): "It would be nice if it was possible to zoom in on things like the 12-lead ECG a little bit. It was pretty small. In real life you can actually, I mean it is only so big, but at least you can pick it up and peer at it." Thus, a desire for the ability to enlarge small images exists from these experiences with the phenomenon.
- *Overlapping and competing sounds during assessment*. As mentioned earlier, one of the students had to assess the lung sounds in the virtual patient and although the lung sounds were heard, there was no isolation of sounds; instead, "you would hear the conversations on top of the chest sounds and the there was a whole bunch of feedback from the microphone…just when I listened to the chest sounds…you couldn't really get it clear."
- *Distracting automated avatar.* Another participant found their experience with medication retrieval distracting and unrealistic when the automated avatar at the nursing station desk repeatedly stated the same thing: "Your patient is inside the room….your patient is inside the room…" while attempting to dispense the required medications.
- *Pop-up window during debriefing.* A few participants found the experience of the pop-up window with the stated learning objectives at the end of the simulation during debriefing

to be a hindrance and distraction, blocking their view of both the facilitator and their team members, as seen in Figure 5.

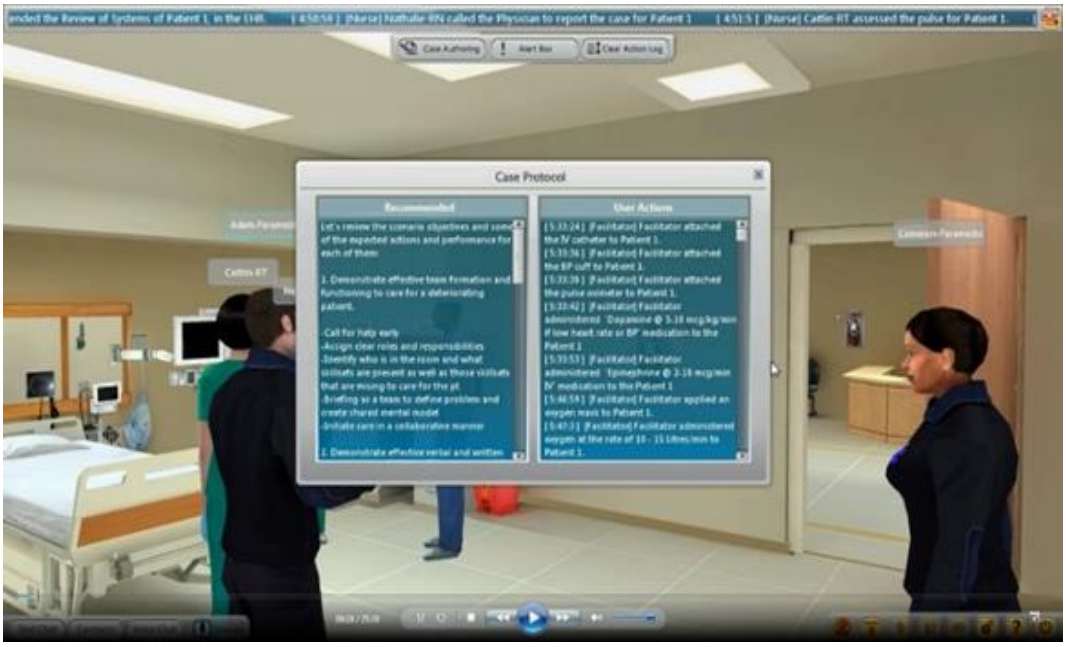

Figure 5. Learning objectives and instructor notes block the view of one another as participants during the debriefing; a perceived negative finding for maintaining presence as the participants desired to "see" one another, looking for non-verbal cues and prompts during the debriefing.

James states, "I couldn't close it, so I tried to move it to-I don't know why, but I was trying to look at them when they were talking." Others found that their attempt at closing the window disengaged their attention and focus to the debriefing experience.

- *Awkward menu selection.* A few participants found the menu selection awkward "to make my movements sort of efficient and the assessment feel like it was going the way it should…the sense of reality was a little bit off." Others expressed their thoughts that this feeling of awkwardness most likely resulted due to a lack of familiarity and practice with

the VW simulation interface prior to attempting the simulation. This is described further in Theme 2, Orientation and Preparation Requirements.

Although not a common experience as a whole, each of these findings point to some of the capabilities and constraints of the VW interface and technology, opportunities for improvement of the technology itself, and reinforces some of the other overarching themes that emerged from the data analysis.

Theme 4: Achievement of positive IP teamwork learning and practice. In this final theme, participants described several significant experiences specific to positive outcomes and evidence of IP teamwork practice within the VW simulation. Three sub-themes provide further structure and understanding of this overarching theme, including (4.1) IP Socialization, (4.2) A Safe and Motivating Place to Practice IP Teamwork, and (4.3) Evidence of IP Teamwork Learning and Practice.

Theme 4.1: IP socialization. As participants described their experiences with practicing IP teamwork in the VW simulation, significant statements and meanings drew attention to the ability to "get to know one another a little bit better" and a place "to interact with one another." Other words and phrases used to describe this experience included a "place to build rapport, trust, and closeness", "less bias, judgment, and stereotyping in the VW", a "sufficient level of closeness formed to be able to interact as a team", "a good opportunity for students of various disciplines that might not normally work together or meet one another prior to graduation", and an "ability to be honest during debriefing discussions." One person stated that you gain "just a different perspective of other people" after completing the simulation in the VW. All of the participants felt that "we did pretty well considering the fact that we never met each other

before…we communicated pretty well and there was no perceived tension among ourselves." A common experience by all participants was the ability to develop new relationships with other disciplines and to simply "get to know one another more", namely, IP socialization.

Theme 4.2: A safe and motivating place to practice IP teamwork. In this theme cluster, participants described the experiences with the phenomenon as a safe and motivating place to learn and practice IP teamwork as geographically separated students. Several of the participants used words and phrases to describe their experiences such as "a positive supplemental learning tool for remote and distance learning students", a "psychologically safe place to learn", "no fear of rejection or humiliation from others if unsure what to do", and a "willingness to learn from mistakes with one another." Conrad confirms these findings,

> I think it's an excellent asset for building teamwork skills and being able to communicate in a way that doesn't hurt other people's egos and feelings. The conversations that you have with these people, the ability to learn from mistakes to create a better way and to communicate with someone can definitely be done in this VW.

One participant described the experience of different people in different places meeting together at the same time to be "cool" and very desirable. Perceiving the future ability to access the VW remotely from home was described as another motivating factor by participants. Lisa states,

> I really like – like Irene had said, how we could have more people from around wherever in the one place at the same time, working as a team. I really think this program can go far – like have a program for all of the students, you know, just kind of log in, have your own avatar and go and do simulations and practice at home. I think this is so great that

> you can do it from home. I think you will go really far with this so …there are some little tweaks of the technological elements kind that you have to get used to, but I think it's just a starting point – then I think there is a lot of potential.

James described his experience as "a really good opportunity for bringing a lot of people together that might not normally see each other." James continues to disclose how he has "never before really interacted with nursing or RT or med students" and has "never had the opportunity to…" which provides meaning in better understanding the VW simulation as a motivating and safe place to meet other healthcare students and practice IP teamwork competencies as part of the curricular outcomes and objectives.

The VW simulation is also described as a safe, no-risk, and slowed experience to practice IP teamwork which is perceived to be a motivating factor to enhance learning and competency and greater transfer of the experience to future patient care. Leona describes this experience clearly:

> Leona: I think that the slowness of it actually, in this point, actually helps with the teamwork because you have the time to think about it and there isn't a real patient, like you know the patient isn't real so you can take the time when you're learning, so then when you're in the real situation, you'll be that much faster to get that…you know sort of an opportunity to practice without putting anyone in danger.
>
> R: Time to process…
>
> Leona: Exactly.

This experience of not "putting anyone in danger" was further discussed and linked to the importance of patient safety and a reduction in errors from "first time" practice on real patients by first practicing in the VW simulation.

Mutual feedback during the debriefing was also described as a motivating factor by many of the participants. One participant found that "hearing that perspective of feedback from both the patient (actor) in addition to the other healthcare members was great." Mutual feedback was also described as a positive and motivating element as part of collaborative practice while making clinical decisions in the VW simulation. Susan reflects on her experience, "It was definitely good to get feedback from like the nurse and the paramedic on what they could offer to the treatment plans as well as inputting your own decisions and it's nice to bounce ideas off of other professions, as like in class we only have our RT to RT, so it's kind of hard to get a different sense of what type of drugs to use because we all learned the same thing."

Several participants shared jovial and motivating experiences with their avatars in the VW, finding the uniforms specific to their disciplines to be the most important element. Most participants agreed that having avatars that looked like oneself was "fun" but not necessary to maintain motivation in the learners. Only one participant felt strongly about their avatar stating, "I think if we were to have this program, I would definitely make my avatar look similar to me, I think." All of these sub-themes, examples of significant statements, and formulated meanings above point toward the VW simulation to be a safe and motivating place for students to practice IP teamwork within the curricula of healthcare education.

Theme 4.3: Evidence of IP teamwork learning and practice. This final sub-theme formed a cluster of meaning units describing several common experiences and evidence of

practicing core competencies of IP teamwork, resulting as positive outcomes from the VW simulation phenomenon.

All of the 10 participants experienced greater awareness of the scope of practice and role clarity of each discipline represented on the IP team in the VW simulation. Jon, one of the students notes, "I didn't know what other people were capable of and a lot of times instead of asking one person to do something, I would just say I need this done and hope that someone heard…there was less closed-loop communication that way." Lisa and Irene share their experience of interacting as a paramedic and nurse in the simulation, recognizing potential tension and conflict between the two roles:

> Lisa: Our roles overall are all very overlapping, but we do have a lot of differences. I think that's why paramedics are seen as A type personalities and a little bit more aggressive because we do have all these standing orders already, because they are needed in the emergent situation. I see it as an emergent situation, and I want to start doing stuff and you (RN) kind of often have to wait for orders…that is where the conflict comes in I think.
>
> Irene: Like I said earlier, I think you do get that perspective on the other professions, like now I know why you do the things you do just because you're taught to react and we're kind of taught to like wait for orders and assess first kind of thing, so you can see where that kind of communication breakdown could happen and I guess that is what we learned today and how crucial it is to get to know your team members first and I think that's what maybe we lacked a little bit, was that time to kind of communicate with each other to kind of build our selves first before we go help this patient. I don't know how realistic

> that is in the healthcare setting. I just know you get more effective work done if you have a really good team that knows how to communicate with each other.

This data extract highlights both of the participants' experiences with needing to better understand one another's scope of practice and roles on the team as well as the importance of knowing how to effectively communicate with each other regardless of being unfamiliar team members.

Other IP teamwork skills and competencies that were practiced and applied in the simulation included leadership, followership, communication, situational awareness, conflict resolution, and challenging authority for the purpose of patient safety. Sara also experienced the importance of being deliberate, stating, "because it helped me to see that in real life sometimes if you don't delegate sometimes things don't get done or it is very chaotic, so I think it's good to just say, hey James go get this or Jon get me that…". Sara explicates further her experience of observing a team member challenge authority in a professional and assertive manner. She continues, "I think it was James with Dr. Jones – that to me was great because personally in real life, I would have been intimidated because it's the doctor and I would feel like he knows more but again just being able to question his order and do it in the professional way." Later on, Sara once again communicated her new awareness for needing to be more assertive on the team because "otherwise if you're not, you just might find yourself on the sideline." Sara's experience also highlights the evidence of the practice of effective communication, challenge of, and questioning when addressing hierarchy and those superior to you for the purpose of patient safety and patient advocacy.

The core competencies of mutual support, collaboration, and use of expertise on the IP team was also a common experience and practiced by the participants within the phenomenon. Diane notes how she was able to access the 12-lead ECG in the simulation but recognized that "I'm not great at interpreting a 12-lead" and subsequently approached the paramedic on the team for further support and help, knowing that "they respond to a lot of these types of calls." James also describes a similar experience during the "middle of the simulation" where the team decided together to collect an arterial blood gas (ABG) sample on the patient. James notes,

> I know nothing about ABGs right now, I'm only vaguely aware of them, so having an RT in the room who is able to get them and interpret them was really fantastic…role support is nice to practice and learn and see how different professions can fit together and find the best things that they can do for the patient.

Another participant experienced an emotional response to another member of the healthcare team in the simulation, stating that "I did want to say something" but chose not to speak up out of fear of challenging another person, resulting in a potential high-risk situation for the patient due to the lack of communication. Others described similar experiences where tension and conflict emerged during the simulation, requiring soft skills such as diplomacy, conflict resolution skills, as well as assertiveness to resolve the issue on the team to allow for continued and optimal patient care, all of which are examples of core competencies of IP teamwork that were practiced in the VW simulation.

Several students recognized the need for providing and requesting situational awareness updates as well as maintaining communication on the team. Lisa experienced a break in communication and situational awareness when leaving the room to retrieve medications for the

patient. She states, “It think it was pretty good in that when I went out to go get meds, I didn’t have any idea what was going on so I had to get an update every time I went into the room…just like in real life…it made you listen…”. Others echoed the same experience of having an opportunity to develop their situational awareness requests, updates, and listening skills on the team within the phenomenon.

Remaining evidence of positive learning and practice of IP teamwork skills in the simulation included greater understanding of work efficiencies on the team and in the hospital, mutual feedback practice, and a change of attitude toward one another in terms of increased respect and patience. The degree of a changed attitude was described by all participants to be linked to the degree of socialization, leading to an increased desire and openness for understanding and inclusion of one another’s role on the IP team.

Several participants also described a heightened awareness for practicing patient advocacy and engagement in the VW simulation. Some felt that they had continuous rapport and dialogue due to the use of a live voice for the patient and the ability to speak with them. Patient safety, a term that was frequently found as horizons in the data extracts by several participants, reflected a pattern representing their positive intentions for doing their best as an IP team, with a sense of “togetherness” for providing patient-centered care during the simulation.

Figure 6 below provides a summary of what the participants experienced in regard to core competencies of IP teamwork that were practiced and developed in the VW simulation. The thematic map in the appendix further describes each of the formulated meanings in richer detail within Theme 4.3.

Positive outcomes of IP teamwork practice within the VW simulation	
Mutual feedback	Assertiveness and delegation
Role clarity awareness and scope of practice	Knowing your environment
Confrontation of others on team	Attitude change toward others resulting in increased respect, appreciation, and patience
Recognizing high-risk situations and patient safety promotion	Expertise access and clinical support on the team
Self-awareness and self-management during an emotional response	Situational awareness updates
Collaborative practice when making clinical decisions together	Communication and listening, including closed-loop communication
Work efficiencies in hospital	Accountability and challenging of others
Leadership	Awareness of potential conflict and conflict resolution

Figure 6. Core competencies of IP teamwork that emerged within and from the VW simulation.

Structural Description

Upon completion of the phenomenological reduction above, the researcher engaged in imaginative variation to further reflect on the underlying conditions and factors that might have accounted for what was experienced; "its aim is to grasp the structural essences of experience" (Moustakas, 1994, p. 35). The concept of "free fancy", an act of further reflection and exploration of different or converging perspectives and the variation of these possible meanings is similar to "brainstorming" from multiple vantage points as the researcher looks toward the bracketed phenomenon; this exercise was completed in this study with the intent to discern the structural elements or dynamics that gave rise to the textural qualities described above and to assist in understanding how the experience was experienced by the participants (Conklin, 2007). The structural description below attempts to capture the foundational elements to the experience and bring greater focus and concentration toward the meanings and essences of the participant experiences as a whole (Creswell, 2007).

In what context or "how" did the participants have this experience? One of the underlying conditions that emerged from the data was the issue of preparation. Several of the participants described a lack of familiarity and comfort with the technology due to a lack of preparedness, insufficient practice time, and orientation. Several students described the need to "adjust to the menus" in the VW and lacked knowledge of how to do things within the VW leading to an unnecessary frustration with the technology itself. These factors resulted in impacting the "what" of their experience with the phenomenon.

Another context in how they experienced the "what" included a lack of non-verbal communication. A common invariant structure underlying the textural descriptions was this desire and need for body language and the ability to read one another's non-verbal communication, having an impact on what they experienced with the phenomenon. Several students echoed Conrad's comment, "You can never replace non-verbal…as a result, it was too hard to tell who was talking at any one time without the body language…things like eye contact." This limitation impacted the ability to practice authentic IP teamwork and was one of the foundational structures of what was experienced by the participants in this context.

Previous face-to-face simulation and IPE experience was another important factor in how the phenomenon was experienced by the participants. Several students had previous face-to-face, real-time simulation learning experiences for the purposes of practicing IP teamwork, stating that this impacted how they experienced the VW phenomenon. A general sense of less enthusiasm and perceived potential for the VW simulation existed in the data if participants had prior face-to-face simulation experience and yet the same participants communicated that they saw value in complementing both modes of simulation with one another for added-value. Many of the same students described a tension between how they experienced the VW, as both a "real-time"

simulation versus "the slowness of the VW simulation" which supported learning and practice, providing "time to process in a safe setting." Participants as a whole described this underlying satisfaction of the real-time "sense" of the VW simulation that at the same time also allowed for slowed practice, providing opportunities for application of IP teamwork competencies such as communication, mutual decision-making, and collaboration. This underlying structure accounted for what the participants experienced with the phenomenon.

Psychological safety and motivation was another pertinent factor in how the phenomenon was experienced by the students. Many of the participants talked about the ability to have "safe conversations" and the ability to "learn from their mistakes" similar to face-to-face simulations. A psychological safety and "buy-in" existed as the participants experienced the phenomenon, resulting in "what" was experienced in the textural description above including a greater uptake of, enhanced motivation, and ability to practice IP teamwork skills; thus, another underlying structural theme and dynamic of the overall meaning and essence of the experience.

Another precipitating factor and dynamic that influenced how the experience happened included the level of clinical experience of the participants. How participants experienced the phenomenon was impacted by their self-efficacy to perform within the clinical context and ability to draw from pre-requisite knowledge. A lack of clinical experience and/or knowledge influenced how each of the participants experienced the phenomenon and what they might have experienced overall. One participant states, "I don't have too much clinical experience so I think that definitely impacted how I reacted to the scenario as well as having to treat this as a real life scenario." Those participants that had a greater amount of clinical experience naturally moved into leadership roles and often played a more dominant position than others with less clinical experience. Some participants that were predicted to be leaders due to their discipline and

background resulted in being followers due to a lack of clinical knowledge, Interestingly, all the participants still affirmed that regardless of their level of experience, clinical learning and teamwork skill development still occurred; thus another underlying structure of how the experience happened for the participants.

Another underlying dynamic that accounted for the participants experiences included the realism of working with unknown or unfamiliar team members. Several students describe this sense of having been 'thrown into a situation" needing to interact not only with unfamiliar team members but also other characters, known as confederates, in the VW simulation. The need to complete the required tasks and treatment for the patient in real time was described as promoting further learning and appreciation for the importance of teamwork. Lessons of IP teamwork resulted from how they experienced communication breakdown due to not knowing each other as well as needing to make communication a priority. This underlying structure accounted for what they experienced with the phenomenon and resulted in promoting the need to define one another's roles and scope of practice further to safely and promptly care for the acutely ill patient.

Another underlying structure experienced by the participants was a sense of promotion of dependency on one another. All of them spoke about a desire to "tap into other experts on the team" for enhanced patient care while experiencing the phenomenon. A recognition of overlap of skills and knowledge happened throughout the experience and heightened awareness of how each discipline and team member "tackled and completed a skill in a different manner." As Irene stated, "It was great to get different perspectives and feedback from the other team members on wat we should do for the patient", thus impacting their experiences with the phenomenon.

Another structure that provides meaning of the participants experiences includes a desire to gain experience and practice before real patient care. A common theme that emerged from the data was this common desire to gain experience and have an opportunity to practice IP teamwork in a real clinical context prior to real patient care in the practicum or internship setting. This motivating factor influenced how the participants experienced what they experienced with the phenomenon. One students comment summarizes this general attitude of how they experienced the phenomenon: "The VW simulation provided more opportunities for enhancing IP collaboration and the practice of these IP teamwork skills prior to practicum and graduation."

Another condition that accounted for what the participants experienced included the capabilities and constraints of verbal communication within the VW technology. What students experienced specific to practicing a key competency such as communication within a team was impacted by how the experience happened specific to these limitations of communication. One student stated, "There was an inability to have sub-group conversations in the same room" which impacted what the experience resulted in by participants. Another student stated, "Two roles and voices early in the simulation were fine, but as soon as more than two roles and voices appeared, we needed to wait to speak until others were done as people were afraid of speaking over one another." The underlying structure of a lack of comprehensive communication abilities such as minimal non-verbal communication forced the use of often unnecessary or excessive verbal communication, feeling unnatural and limited the ability to practice this vital teamwork skill. Yet, the vast majority of participants still valued and preferred the live voices of one another over alternative modes of communication such as chat or text and tolerated the verbal communication limitations as it was still perceived to be more realistic than all other forms of

communication that could be afforded in a VW context; thus another factor impacting the overall experience of the participants.

The textural description included the achievement and evidence of positive outcomes for IP teamwork skills practice within the VW simulation. One of the underlying structures that was described to have supported this outcome was the authentic and synchronous clinical context and setting in the VW simulation itself. Participants agreed that the live experience with live voices, seeing one another albeit as avatars, heightened the learning experience and offered a platform to practice IP teamwork competencies both innately and intentionally, and an avenue to apply the knowledge to a safe, practice setting. What participants experienced with the phenomenon was influenced by this underlying structure and perhaps acted as a springboard for these teamwork competencies to emerge within the VW simulation phenomenon.

The various underlying structures described above have emerged from the data through the consciousness of the researcher through further reflection and revisiting of the invariant structures, including the validation process with the participants as co-researchers.

Synthesis and Essence of the Experience

In phenomenology, the ultimate goal is to "understand better what it is like for someone to experience that" (Polkinghorne, 1989, p. 46, as cited in Creswell, 2007, p. 62), that being the lived experience of being a geographically separated healthcare student practicing IP teamwork within a synchronous VW simulation. From the individual descriptions, "general or universal meanings are derived, in other words, the essences or structures of the experience" (Moustakas, 1994, p. 13). The synthesis statement below, in the form of several short paragraphs "attempts to blend the palpable, idiosyncratic details of each participant, and the fundamental, structural

themes into one final integrated document that captures both the unique and the universal. A final representation of the phenomenon in all of its fullness is what this description aspires to" (Conklin, 2007, p. 27). The textural and structural descriptions of the experiences are synthesized into a composite description of the phenomenon through the research process referred to Moustakas (1994) as "intuitive integration" (p. 100). This description becomes the invariant structure of ultimate "essence" which captures the meaning ascribed to the experience (Moerer-Urdahl & Creswell, 2004).

What is it like to practice IP teamwork in a VW simulation as geographically separated healthcare students? This lived experience begins with the need for comprehensive preparation of the learner prior to exposure to the phenomenon to ensure a fertile ground for practicing IP teamwork and mitigation of obstacles which might lead to frustration and a limited learning experience. Preparation requirements described by the participants include an orientation to the VW technology, to one another as team members, and to the methodology of simulation.

The common experiences of the participants includes a desire for further IP teamwork experience and practice within an authentic simulated clinical context prior to real patient care in the clinical setting. Participants as a whole describe the achievement of gained experiential learning from the VW simulation specific to these soft skill teamwork competencies as well as gained clinical learning and experience.

The experience of a VW simulation is comparable to a face-to-face simulation for the purpose of practicing IP teamwork and particularly desirable for students who have never experienced face to face simulation before or have not yet learned or practiced IP teamwork thus far in the curriculum. There is a clear recognition by all participants that both modes of

simulation have their strengths and weaknesses, thus an opportunity to integrate both instructional modes of simulation in healthcare curricula to complement one another for the purposes of practicing IP teamwork.

Participants found value in learning from others with varying levels of clinical experience and knowledge. Although the dynamic of the experience changed depending on the level of the student, learning still occurred and was not seen as a significant issue or limitation to the experience but rather an opportunity for further learning opportunities from one another as students. Nevertheless, participants describe and communicate the need for curricular considerations specific to timing and selection of students when partaking in the VW simulation.

The participants as a whole described their perceptions of capabilities and constraints of the VW simulation technology, many of which could have been prevented with further orientation and preparation opportunities. The VW simulation experience provides an adequate level of a realistic setting but with limitations to the various dimensions and facets of communication and the lack of ability to practice all of these nuances of communication due to technology constraints. All participants had a common experience of lacking the ability to read body language and other forms of non-verbal cues and consequently resulting in unrealistic and over-dependency as well as overuse of verbal communication. Even so, the participants as a whole described positive results and approved of the sufficiency of the discourse tools within the context of a VW setting for the purpose of practicing IP teamwork as geographically separated students.

Practicing IP teamwork in a VW simulation has its limitations for participants specific to the inability to practice these skills alongside realistic clinical tasks. The nature of the digital VW

is one that cannot authentically reproduce every clinical skill and task that can be completed in a real setting; rather, the clinical skills and tasks within the VW are perceived by participants to be present for the provision of a clinical context and visible cues and not the focus of practicing psychomotor skills. An adequate "act" of completing the clinical skill, albeit lacking realism, was sensed by the participants to allow for the more important focus of the cognitive and affective domains of soft skills practice, i.e. IP teamwork, for this study.

Practicing teamwork skills as geographically separated students in a VW simulation affords a psychologically safe opportunity to socialize with other healthcare disciplines prior to the real practice setting and increase awareness and appreciation for the value of working together as an IP team. A sense of mutual respect and better understanding of one another's role on the IP healthcare team is another positive outcome from this phenomenon.

Despite some technology limitations, participants as a whole still felt immersed in a realistic clinical context that provided an opportunity to apply and practice core IP teamwork competencies within their VW simulation experience; skills such as leadership, closed loop communication, role clarity, situational awareness, assertiveness, delegation, patient safety promotion, access to expertise, and conflict resolution. Practicing these skillsets of IP teamwork appear to be transferable to the real world due to the immersion and sufficient levels of realism within the VW to accomplish the practice of these teamwork skillsets. Overall, the essence and meaning of the participant experiences, described an inviting attitude toward the importance of IP teamwork as well as their perceived acceptability, ability, willingness, and potential to practice these skills within a VW simulation and is a common thread throughout the data.

Member-Checking for Accuracy and Validation of the Results

Chapter 3 included a brief discussion on the validation strategies that were deployed in this study, including the act of communalization, or member checking. In addition to a few follow-up individual interviews during the data analysis phase of the study, the final draft of the data analysis as well as a copy of the complete study was shared by the researcher via email with each of the participants, requesting further feedback and confirmation of accuracy and comprehensiveness of their experience with the phenomenon. Seven of the 10 participants responded to the researchers request for feedback and validation of the analysis. The feedback provided was the final act of data collection in this study and used to complete the final revisions of the synthesized essence statement above. In addition, the researcher chose to include the initial verbatim feedback from five of the participants for the purpose of (1) examples of evidence of this validation process, (2) an extension of the results found in this study, and (3) providing further insight to the reader. The five verbatim examples below were the last and final individual interviews as data collection and member-checking that the researcher had with the participants, which occurred approximately 17 months after the initial data collection via focus groups.

James (pseudonym use continued) writes the following as his feedback regarding the analysis:

> Just finished reading through the draft, and my thoughts are as follows. First and foremost, to the question of whether this communicated accurately my experiences and feelings toward the study: YES. I read through Ch.4 and 5 in their entirety rather than skimming and my experiences were absolutely communicated and represented within the text. I found myself jotting down notes as I read, only to have those notes addressed and

stated further on in the document. For instance, I found myself recalling the lack of sub-communication groups during the sim, which was addressed in the draft as well as recalling my feelings towards 'buying in' and it's importance, which was also carefully addressed. As I read through the thesis, I found myself recalling more and more details of the experience, all of which were brought up and addressed during the thematic breakdown. I actually found myself not only jotting notes regarding my memories of the event, but of reminders to myself on how my interaction with the VW sim could be improved in the future. My total gestalt of the experience, summed up in a bad disjointed sentence, would be as follows: "VW sim for the purposes of exposing to and training in 'soft skills' or communication techniques between interdisciplinary teams separated by geographical boundaries works, but is most beneficial for novice learners who have not yet experienced the same interaction in a f2f environment." This summary is absolutely present in the thesis and was not difficult to identify.

Jane, after reviewing the analysis in this validation process, stated the following:

I took a look over it and I completely agree with the thematic map. One of the comments I can make connecting my experiences now to when I participated in the simulation, is that the simulation was a great bridging step towards even more real life simulation sessions that I have encountered. What I mean by that is in medical school, it can be a daunting experience to be put in a medical emergency scenario if you've never seen it before, so having a gradual introduction to it by doing the simulation first was nice. In addition to that, we do not get many learning opportunities that incorporate different health disciplines so it was great to have that aspect which promotes the multidisciplinary approach to patient care.

Jon, another participant wrote the following as his feedback:

> I think it was very unbiased and represented everyone's comments equally and factually. I read the appendix and Themes breakdown, as well as the essence/summary section. I started reading the main body but that might have to wait until I really have a lot of time on my hands. As for what I read-the points are extremely thorough. There wasn't anything I could think to add or take away. Because the points are a collection of 10 people's thoughts, there were some that I didn't agree with, but that doesn't mean they weren't true for someone else. Everything you wrote makes sense and I think it expresses the study well. There was only one point that I thought wasn't expressed by myself and that was that the virtual world simulation was comparable to face to face learning. The experience of a virtual world simulation is comparable to a face-to-face simulation for the purpose of practicing interprofessional teamwork and particularly desirable for students who have never experienced face to face simulation before or have not yet learned or practiced interprofessional teamwork thus far in the curriculum-pg. 107. In the same paragraph you elaborate that participants agree they each have their strengths and weaknesses (i.e. virtual vs face to face) which I do agree with. Throughout the main body of text this elaboration is quite extensive and I think because of that, it still captures what I feel about the VR simulation. To me, however, I remember VR and F2F being very much different with definite strengths and weaknesses. I'm using my experience at events like Saving Stan and the NAIT paramedic program to compare the two. That's why I think that's the one statement I don't agree with 100%. After I read it ten times over, comparable could be taken a lot of different ways. You can either read it to mean "similar in some aspects but not the same in most" or "mostly the same with some

> differences". So maybe it's just the way I, the reader, choose to read the word "comparable" in my head. Ways that I think the two are comparable include everything you listed such as "conflict management" and "treatments" and "interdisciplinary collaboration". Things that I don't think are comparable include things that are maybe a little less tangible, like simple physical presence, body gestures, amygdala hijackings, time seems to fly by when it's F2F, physical use of tools and techniques, etc. So, I guess since there are some things that are comparable and some that are not, I half agree with the statement that VR is comparable to a F2F simulation. Hope what I'm saying makes sense. It really was a small thing but you said you wanted us to let you know if we saw anything!

Leona, another participant, provided a succinct affirmation of the analysis:

> I have skimmed through the areas you recommended. I apologize for being later than was ideal for you, caught some bug. Things started to come back for me as I read through your paper and I believe that overall the main themes of my experience have been captured. I do not have anything I would like to add or change.

Lisa, the final participant and example of member-checking, also provided brief but affirming feedback similar to Leona above:

> So I read the thematic map and feel like you were very thorough when it comes to breaking down the themes of the experiment. It's fascinating to see how an experience such as the one that I encountered is broken down and analyzed. At this time I don't have anything else to add or change.

The five verbatim examples of feedback above demonstrate the evidence and extent of the detail that was provided during this validation phase of the study and were used to refine the analysis as well as shared with the reader above.

Discussion and Return to the Literature

This current study began with a problem statement related to a lack of understanding of the overall essence and meaning of geographically separated healthcare student experiences with practicing IP teamwork soft skills in a synchronous VW simulation. The 10 participants as co-researchers in this study focused and refined their divergent experiences to four salient convergent themes as part of the phenomenological reduction process which included (1) Curricular Integration Considerations, the need for (2) Orientation and Preparation Requirements, (3) VW Capabilities and Constraints for IP Teamwork Practice, and (4) Achievement of Positive IP Teamwork Learning and Practice within the VW simulation.

As noted earlier, Brown et al. (2000) identified various situated learning characteristics which are present and consistent with the findings in this current study (as cited in Kommers, 2012). Some of these characteristics included the importance of an authentic clinical context to embed and support meaningful learning specific to IP teamwork. Participants described the use of a VW simulation as a "more than adequate" context to situate their learning for this learning outcome and communicated the importance of even further enhancement of the authenticity of the context to ensure being situated in a "true to life" experience. Dabbagh & Bannan-Ritland (2005), advocates of constructivist thinking, posit that the context or activity is just as important as the knowledge itself to support and promote authentic and meaningful learning, which aligns with the results from this current study.

Consistent with Rosen et al. (2008), this current study shares a similar finding to their work specific to simulation-based training (SBT) and the ability to enhance or expedite experiential learning. All of the participants reported various forms of accelerated experiential learning from their VW simulation experience related to both clinical knowledge and IP teamwork soft skill experience. The participants described enhanced and expedited experiential learning that was able to be practiced in a safe and risk-free setting, allowing for experimentation of new and various approaches to IP teamwork in the VW simulation. These findings from this study align with Wood, Solomon, &Allen (2008) where they describe the value of these new platforms which can create realistic simulations for safe practice and enhancement of experiential learning through learning from errors made in this no-risk, safe context. SBT theory also supports the findings from this study related to situated learning theory above.

Similar to Williams (2006) sample, participants in this current study experienced the synchronous technologies of the VW simulation platform to be comparable and of "minimal difference" to face-to-face simulations in achieving practice opportunities of IP teamwork competencies; in fact, some participants reported that the VW setting outperformed their face-to-face learning experiences specific to IP teamwork, once again, similar to the results from Williams (2006) study. This current study extends this finding to further report on the potential value in integrating VW simulations sooner within the curricula as a distance learning opportunity for practice of teamwork soft skills with other healthcare students and perhaps prior to, and complementary of, face-to-face simulation experiences within the curricula. Participants also described the perception that VW simulations have a greater economy of scale and less effort to create than face-to-face simulations, especially for distance-separated students. This is a contrast to Duncan & Larsen (2012) who found a large amount of preparatory work in

developing technology-enabled simulations as well as increased costs and time required to do so; however, the author of this study confirms a comparable amount of time in developing a VW simulation to a face-to-face simulation as an end-user of the technology and as the participants described, see the potential for "reaching the masses" beyond what a face-to-face simulation can offer for geographically separated students. Kommers (2012) also reported successful use of information and communication technologies (ICT) for the purpose of soft skill development in healthcare students with patients. This current study extends these findings once again, specific to the use of ICT for enhancement of soft skills for both the patient as well as IP healthcare team members and their engagement with the patient and with one another.

Aligned with Driscoll (2005), the current study found that student attitudes toward one another changed from the use of an e-simulation (i.e. VW) including several positive outcomes including an increased respect, appreciation, understanding, acceptance, and patience for one another as IP team members. Gagne (1972, as cited in Driscoll, 2005) suggests that attitude is one of five key learning outcomes in effective instruction which was present in the data and achieved in this study specific to practicing IP teamwork in the VW simulation.

Theme 4.2, A Safe and Motivating Place to Practice IP Teamwork is consistent with Keller's (1984) four conditions for motivation in learning (A-attention, R-relevance, C-confidence, S-satisfaction). The participants in this study described the phenomenon as a positive and engaging supplemental learning tool for remote and geographically separated students, a "cool", fun, and desirable learning adjunct for practicing teamwork, a psychologically safe place to practice and learn, encouraging and inspiring from perceived support from team members, and no fear of rejection or humiliation from others if they were unsure what to do during the simulation. Students described increased confidence with IP teamwork and clinical knowledge

from the experiential learning opportunity in the VW simulation, and felt engaged with the relevant context throughout the duration of the phenomenon. The themes in this current study extend the ARCS model further to the VW simulation context by pointing to the importance and perceived value of comprehensive communication techniques (satisfaction), ensuring preparedness in the learner to engage with the technology (attention and satisfaction), the creation of an authentic, realistic context or clinical situation (relevance), and a sufficient level of complexity (confidence-building) to further support motivation in this method of synchronous collaborative online learning (COL).

Reeves et al. (2010) communicates a concern and opportunity for further research specific to the negative impact of professional socialization on collaborative practice in healthcare. Theme 4.1, IP Socialization, emerged from the data in this current study, where participants described the phenomenon to have provided an excellent opportunity for IP healthcare students to "get to know each other", socialize and meet other healthcare disciplines, and a sense of "real time togetherness" for geographically separated students. Bonds were created among IP healthcare students and new attitudes formed about one another as mentioned earlier when practicing IP teamwork in the synchronous VW simulation, thus, extending Reeves et al. (2010) research findings. These findings from the data are also consistent with Bronack, Riedl, and Tasner's (2006) results that "3-Dimensional VWs offer an incomparable environment for creating spaces where teachers and learners separated by distance can engage in the social activity of learning" (p. 220). Edirisingha, Nie, Pluciennik, & Young (2009) also found similar findings to this current study with 3-D multi-user VWs (MUVE) where "real-time interactions" with the use of avatars can facilitate "relationship-building" and a "sense of presence" for the purposes of socialization (p. 458). Participants described their experiences with these exact

words in the data, but also expounded on socialization to other concepts related to synchronous student-student interaction (Moore, 1989) and immediacy, closeness, social presence, and co-presence (Woods & Baker, 2004) that was afforded in the VW simulation. This current study extends the various literature findings above related to immediacy and interaction with Theme 3.1.a, Verbal and Non-Verbal Communication: Strengths and Opportunities and Theme 3.1.b, Verbal and Non-Verbal Communication: Weaknesses and Limitations, by pointing to the continued need for enhancing synchronous voice-enabled communication beyond dyadic conversations, even though the use of real voice was found to be desirable and effective in several situations and preferred to the text chat feature for ensuring immediacy and the need for further improvement of non-verbal cues and gestures as avatars in the VW to further enhance immediacy and presence as IP team members to ensure a rich, realistic and genuine experience. Yet, the data points to satisfaction with the current levels of presence and immediacy in Theme 3.2 and 3.2.a, namely Realism and Authenticity of IP Teamwork in VW Simulation and Physical Attributes and Presence, where participants describe an immersive environment with several examples of emotional attachment and engagement with one another as avatars including less bias and judging of one another compared to face-to-face simulations and supports IP socialization regardless of insufficient non-verbal cues and limited verbal, dyadic communication.

Consistent with Duncan & Larsen's (2012) research findings, Theme 2, Orientation and Preparation Requirements and Theme 2.3, Training and Orientation to VW Interface, this current study identified challenges of student orientation to the technology and affirmed the importance of adequate and mandatory orientation and training prior to the use of the VW technology as a teaching tool to ensure an optimal learning experience for practicing IP teamwork as healthcare

students. This current study extends their research with Theme 2.1, Orientation To One Another and Theme 2.2, Orientation to Simulation as an Instructional Method that emerged from the data by suggesting that orientation to one another as "strangers" should also be included for a heightened awareness of one another's scope and current level of knowledge as well as to be trained to the tenets of simulation as a teaching strategy and how "to behave" and what to expect in a simulated environment prior to the use of.

Previous research with the use of VWs has centered on single-disciplines, i.e. the field of nursing, and found positive outcomes for both technical and non-technical skills training such as teamwork, collaborative decision-making, and communication (Rogers, Miller, & Firmin, 2012). Their sample concluded a general student openness to using online learning technology to learn with other students from other campuses and programs for the purpose of socialization and promotion of professional relationships, which was discussed earlier. These findings were substantiated and extended in this current study to not only single-discipline teams but IP healthcare teams with the following four themes, Achievement of Positive IP Teamwork Learning and Practice (Theme 4), IP Socialization (Theme 4.1), A Safe and Motivating Place to Practice IP Teamwork (Theme 4.2), and Evidence of IP Teamwork Learning and Skill Development (Theme 4.3).

Unique to this current study, participants described the essence and "ingredients" for creating e-based simulation scenarios for optimizing student collaboration in a synchronous VW setting, which is a gap identified previously by Rogers et al. (2012). These seven ingredients, or themes included Curricular Integration Considerations, Prior Learning and Experience, A Safe and Motivating Place to Practice IP Teamwork, An Experiential Learning Tool, Orientation and Preparation Requirements, VW Technology: Capabilities and Constraints, Clinical

Context…True to Life, and Realism and Authenticity of IP Teamwork in a VW Simulation. These themes provide a better understanding of the meaning of optimal creation and deployment, or the 'how" of simulating both single-discipline as well as IP teamwork in a VW simulation context.

Aligned with Dickey's (2003) case study, who explored the pedagogical affordances and constraints of VWs for synchronous distance learning, this current study also found constraints and limitations with the discourse and experiential tools within the VW setting. Themes that emerged from the data include VW Technology: Capabilities and Constraints (Theme 3), Verbal and Non-verbal Communication: Weaknesses and limitations (Theme 3.1.b), Realism and Authenticity of IP Teamwork in the VW Simulation (Theme 3.2), Clinical Skills and Tasks (Theme 3.2.c), and Other VW Technology and Interface Experiences (Theme 3.3). Discourse tools did not impede IP teamwork development, but was perceived to limit the potential of learning and authenticity of the experience due to a lack of non-verbal cues and overuse of verbal, dyadic forms of communication. Use of the VW platform and interface as experiential tools were perceived to also be limited and less authentic than in real life due to the limitations of technology, again, consistent with Dickey's (2003) findings. The current study expounded further on the issues related to discourse and experiential tools from the learner perspective and experience, thus adding to the body of knowledge specific to the affordances and constraints for practicing IP teamwork within a VW simulation environment. An example includes the better understanding of the dynamics of participant interaction with a preference for verbal, audio-based synchronous communication over text-based communication as one finding from the analysis of the discourse tools used in the VW setting. In contrast to King et al. (2008), this current study suggested a student openness and desire for use of supplemental information and

communication technologies (ICT) for enhancing discourse and authentic communication with the use of live video chat tools during the debriefing phase of learning in the VW simulation. Being able to see true non-verbal gestures and cues during communication beyond a static avatar was desired by several of the participants in this study, once again, extending and pointing to further insight to student perspectives regarding this issue.

Moustakas (1994) argues that a "scientific investigation is valid when the knowledge sought is arrived at thorough descriptions that make possible an understanding of the meanings and essences of experience. Evidence from phenomenological research is derived from first-person reports of life experiences" (p. 84). The discussion above attempted to summarize the primary findings, descriptions, and meanings of the participants in this study and its positioning within the existing literature related to this phenomenon. The final chapter in this study will further address some of these findings as implications and outcomes to be considered for application and future practice in healthcare education.

Chapter 5: Conclusion/Recommendations

Summary of the Study

Moustakas (1994) provides suggestions for the final chapter of a phenomenological study including an outline and various sub-headings to be considered with the intent that it "offers a kind of abstract of an entire investigation" (p. 156). This study will follow these recommendations and structure in the writing of the final chapter in this current study.

In Chapter 1, the researcher detailed the growing interest specific to exploring the meaning of the geographically-separated healthcare student experience with practicing IP teamwork in a synchronous VW simulation. This introductory chapter included a background of this curiosity and interest in the topic as well as provided several definitions of pertinent words and concepts related to this study. A statement of the problem was provided and embedded within the growing need for increasing access to, and enhancing IP education and collaborative practice for healthcare students that are separated by campuses or distance and to also better understand the student experience with the phenomenon in this study. The researcher sought to better understand the student acceptability of using a VW simulation as an instructional method and possible solution to address the problem statement and need to develop and practice IP teamwork skills in this manner. This chapter included a brief discussion of the purpose of the study which referenced the importance and need for administrator and educators to value a richer understanding of the learner perspective of practicing these teamwork skills within synchronous VWs to avoid negative outcomes and poor uptake before investing in such a technology. The limitations and delimitations were included in this chapter as well as the carefully created research question and sub-questions using a phenomenological approach to qualitative research.

In Chapter 2, the researcher reviewed the relevant literature on the subject of IP teamwork competencies, collaborative practice in healthcare, needs in distance learning healthcare students specific to IP teamwork skills practice, collaborative online learning (COL), information and communication technologies (ICT), and VWs. Throughout the completion of this investigation and data analysis, the themes of Providing an Authentic Experience, A Matter of the Heart, and Synchronous Online Technologies provided structure and guidance for the selection of key terms and search words as well as further refinement to the literature review within this chapter. 3-D VW simulations sounded attractive, but again, as mentioned in Chapter 2, come with their own inherent issues, problems, and limitations as well as a lack of IP student perspectives on this type of instructional method and learning experience. Chapter 2 identified scant literature specific to the research question and problem statement in this study as well as little use of a phenomenological approach to exploring the meaning of the experiences of participants exposed to such a phenomenon as in this study.

In Chapter 3, the researcher briefly explored transcendental phenomenology as the selected approach and methodology for completing this qualitative study. A description of the various procedures used in this current study were provided in this chapter, which were based on Creswell's (2007) modified approach of Moustakas (1994) transcendental phenomenology assumptions and methods as well as general thematic analysis procedures within qualitative research. The research questions were repeated and reviewed in this chapter as well as a brief overview of the philosophical assumptions of transcendental phenomenology and qualitative research for the purpose of demonstrating the rigor that was used as well as supporting any reader or consumer of this study that might be less familiar with this type of methodology. Data collection techniques were clearly communicated including a description of the phenomenon

under investigation. The data analysis procedures using transcendental phenomenology and inductive thematic analysis approaches were included in this chapter as well as strategies for validating the findings; strategies such as "member checking" and others that add qualitative validity and reliability to the overall study and findings. This chapter finally concluded with a brief explanation of the narrative structure of the study, anticipated ethical issues that could arise as well as those that could be mitigated, preliminary findings from the pilot prior to the launch of the experiment, and anticipated expected outcomes of the study from the use of this selected methodology to be confirmed and reviewed later in Chapter 5.

In Chapter 4, the researcher began with a transparent epoche followed by the application of the phenomenological reduction approach to data analysis. This chapter included an exploration of the significant statements, formulated meanings of these statements, and invariant horizons that emerged from the data. An exhaustive textural description was provided in the form of an inductive thematic analysis. Several themes and sub-themes became self-evident and were used to better understand and communicate an exhaustive description of the 10 participant experiences. A plethora of relevant extracts from the data were included to provide sufficient examples of evidence from the analysis. Following the completion of the phenomenological reduction process, this chapter then described and included the modified use of imaginative variation and free fancy (Moustakas, 1994), communicated a structural description as the researcher, and further reflected on the underlying structures and overall essence of the participants experiences with the phenomenon. The researcher provided the results of the research findings in the form of textures, structures, and a composite textural-structural description, weaving the core textures and structures together into a synthesized essence statement communicated in narrative form using several short paragraphs (Creswell, 2007). This

essence statement was followed by a discussion of these results specific to the lived experiences of practicing IP teamwork as geographically separated healthcare students in a synchronous VW simulation. This discussion of the results included a return to the literature review in Chapter 2 for the purpose of comparing and contrasting the findings from this study and further validation of these findings in both the existing research and this current study. This return to the literature also attempted to extend existing research with the findings from this study as well as point to the original knowledge and findings that add to the current body of knowledge specific to the lived experience of geographically separated healthcare student participants practicing IP teamwork in a synchronous VW simulation. From completing the above, the researcher discovered the overall nature, essence, and meaning of the participant experience as a whole and attempted to communicate the results and a discussion of these findings in this chapter.

The following content in this final chapter will briefly address several recommendations and implications that can be made from the findings in this current study. The relevance of this study to society, social meanings, implications for improved patient care, and my own personal growth and new understanding will also be addressed in this conclusion. The researcher will also critique the selected research methods and procedures and explore some of the limitations and advantages of this research design prior to the conclusion of this chapter.

Outcomes: Social Meanings and Implications for Improved Care

Chapter 3 included several predictions of expected outcomes and goals from completing this study related to social meanings and implications for improved IP teamwork in healthcare. Let us briefly return to these expected outcomes for further affirmation or refinement as well as reflecting on the achievement and fruition of these goals, including the implications of these outcomes from the completion of this study:

- *A greater understanding of the overall essence and meaning of the student experience and learner perspective in the use of synchronous VW simulations for applying and practicing IP teamwork skills in geographically separated healthcare students.* After completing a rigorous analysis of the data through the use of transcendental phenomenology, the researcher was able to identify several themes and sub-themes which painted a clearer picture of the participant descriptions and pointed to a richer understanding of the overall essence of the learner perspective and student experience with the phenomenon. The analysis of this study and its findings has assisted in moving a step closer to the achievement of the expected outcome above.

It is important to reiterate that only one medical student was represented among the 10 participants due to two medical students having to cancel their commitment to the research study due to competing priorities. The impact of minimal medical student presence within the three cohorts of participants may have influenced, either positively or negatively, the attitudes and perceptions of the remaining participants toward medical students; for example, a sense that medical students are not interested in collaborative practice and interprofessional teamwork could have been formed by the other participants in their awareness of the lack of medical student presence. The presence of medical students may have created other positive achievements and outcomes of practicing interprofessional teamwork within a virtual world simulation within the findings. The loss of medical student representation may have had an impact on the results and findings of the overall essence of the common experience of the participants and could be further explored in future research to further extend the findings in this study. Although there was a lack of medical student representation, one can make an assumption that their

experiences, had they been present, would have been quite similar to the other represented disciplines as the common experiences communicated in this study resonated for all participants regardless of their discipline; nevertheless, a medical student perspective adding to the overall experience would have been advantageous, adding even richer data and description of the experience with the phenomenon and a better understanding and achievement of this expected outcome.

- *Application of the essence of these experiences to future institutional planning, decision-making, and budgeting for VW use in healthcare education.* This current study has provided the researcher as well as other healthcare educators and administrators with a better understanding of the participant experience with VW simulations and technology. Several of the themes that emerged from the data provide further insight to both educators and administrators for optimal, efficient, and effective use of this learning technology for enhancing the practice of IP teamwork in healthcare students. Each of the four overarching themes including Curricular Integration Considerations, Orientation and Preparation Requirements, VW Technology: Capabilities and Constraints for IP teamwork Practice, and Achievement of Positive IP Teamwork Practice provide more concrete evidence to guide and apply to future post-secondary healthcare education programming and decision-making specific to the use of VWs in teaching and practicing this important set of soft skills in IP education and collaborative practice.
- *Mitigation of logistical and technology-related issues and hurdles related to VW application for future practice and quality assurance in the use of this educational technology.* As mentioned above, several themes in this study have further addressed this outcome. The theme VW Technology: Capabilities and Constraints for IP Teamwork

Practice included sub-themes 3.1, Verbal and Non-Verbal Communication and its exploration of the strengths, opportunities, weaknesses, and limitations as further sub-themes within this sub-theme. The findings within these themes provide direction in mitigating and preventing logistical and technology-related issues and hurdles that may exist when planning the implementation of VW learning technologies in the curricula. Sub-theme 3.3, Other VW Technology and Interface Experiences, also provides rich descriptions of participant experiences related to this learning technology and provide further consultation for quality assurance in the deployment of VW simulation use.

- *Enhanced quality of technology-enabled learning opportunities via synchronous VWs for traditional and distance learning healthcare students.* The data pointed to an overall acceptance and appreciation for the use of synchronous VW simulations for practicing IP teamwork to support any form of geographically separated healthcare students regardless if enrolled in a distance learning or traditional, face-to-face program. Participants validated the application of this learning tool for both types of learners with Theme 3.2, Realism and Authenticity of IP Teamwork in VW Simulations, Theme 3.2.b, Clinical Context…True to Life, Theme 4.2, A Safe and Motivating Place to Practice IP teamwork, and Theme 3, VW technology: Capabilities and Constraints for IP Teamwork Practice.
- *Decreased perception of distance between healthcare students and institutions in the province of Alberta.* Participants described an overall experience of closeness, IP socialization (Theme 4.1), A Safe and Motivating Place to Practice IP Teamwork (Theme 4.2) and the ability to immerse themselves within the VW simulation due to its realistic clinical context and synchronous, voice-enabled communication. Participant experiences

of feeling "less far apart" and having "greater accessibility" to one another for practicing IP teamwork existed within the findings in the data extracts.

- *Increased socialization and understanding of one another's role in interdisciplinary healthcare student teams.* As mentioned above, the participants described a significant level of IP socialization (Theme 4.1) from their experiences with the phenomenon. Evidence of IP Teamwork Learning and Skill Development (Theme 4.3) included several examples of which IP teamwork competencies and skills were practiced and applied during the simulation and how a greater understanding of one another's roles on the team did occur from the phenomenon. Enhancing mutual respect, patience, and appreciation for one another were examples that emerged from the data and supported this expected outcome from completing this study.

A high-level, altruistic expected outcome for this study was shared in Chapter 3 and is worthy of repeating in this final chapter:

> When a team works 'well', it does so because every member has a role. Every member not only knows and executes their own role with great skill and creativity; they also know the responsibilities and activities of every other role on the team, as well as having an understanding of the personal nuances that each individual brings to their role. This complicated range of elements needs to simultaneously occur if the team is to function in an effective manner. (Reeves et al., 2010, p. 2)

Many of the themes that have emerged from this study have already been discussed above and suggest one giant leap forward toward attaining this lofty goal through the use of synchronous VW simulations for promoting and practicing IP teamwork and a greater awareness of not only

one's own role on the healthcare team, but also the roles, responsibilities, and activities of other team members that are crucial for optimal patient-centered care.

In addition to the expected outcomes above, several other outcomes and implications emerged as a result of this study which "have tremendous potential value for utilization on a personal, professional, as well as societal level" (Moustakas, 1994, p. 170). These "essences are brought back into the world and enrich and clarify our knowledge and experience of everyday situations, events, and relationships" (p. 48) and are briefly discussed below.

Personal level. The new understanding and knowledge that has resulted from self-evidence (Moustakas, 1994) in this study has provided significant value in steering the researcher in "the right direction" specific to future decision-making and application of synchronous VW simulations for the promotion of experiential learning and practice of IP teamwork competencies in geographically separated healthcare students. After reviewing my epoche, I am able to see the personal growth and newness in my own mental models and schemata that have formed from the student participant experiences and the invariant horizons that emerged from the data specific to the phenomenon in this study. This fresh and new insight has provided a better understanding of the essence of the student experience with this phenomenon as well as reformed my own thinking of the application of VW simulation technology for practicing IP teamwork skills in healthcare student curricula.

Professional level. The findings from this study have created a heightened awareness in my own professional practice of the importance of both interprofessional teamwork as well as the importance of intelligent application and deployment of synchronous virtual world simulations to develop the skills of interprofessional teamwork. It is evident from previous literature as well as

from this study that healthcare students recognize the importance of these critical soft skills embedded within interprofessional teamwork and have a desire to practice and develop them early in their education and careers. The results from this study also illuminated the optimal considerations and exciting potential for the use of virtual worlds and the important role that this technology may have in the future for geographically-separated healthcare students practicing these essential skills of teamwork together prior to graduation.

As an educator, I have a much deeper understanding of what might optimize this teaching and learning experience as well as the ability to achieve these soft skill learning outcomes associated to IP teamwork through the use of this virtual world learning technology as the selected instructional method. The completion of this study has pointed to the importance of once again, ensuring the inclusion of the student as the primary stakeholder and consumer of my instructional design and selection of delivery methods in "the classroom" for both traditional, yet geographically separated healthcare students as well as distance learning student contexts.

Societal level. The social meanings from the results of this study include the potential for enhanced IP teamwork and collaborative practice among future healthcare professionals in the workplace. As healthcare continually evolves and grows in its complexities and challenges, there is an ever expanding need for efficiencies among healthcare teams to ensure a balance of optimal patient-centered care, patient safety, and cost effectiveness. Promoting these concepts early in healthcare education including the importance of working together and valuing one another's roles as healthcare practitioners is crucial in creating a safe and sustainable healthcare system for the ever-demanding and growing societal needs in Alberta, Canada, and beyond.

Future Research Studies

The potential for other research study opportunities always exist upon further reflection nearing the completion of a study, looking back to its original problem, purpose, research questions, design, and subsequent results. One identified opportunity for a future research proposal is the further exploration of this current study, but a shifted focus away from the student perspective and toward the instructor and simulated patient perspective. For example, the following primary research question might guide the development of this future study: What is it like to be a standardized patient and an instructor in a VW simulation environment to facilitate soft skills and teamwork development in healthcare student education? A phenomenological qualitative approach would once again, provide the framework for this type of study to better understand the lived experience of faculty instructors who are expected to develop, deliver, and evaluate the effectiveness of a VW simulation for the purpose of practicing and developing teamwork skills and other associated soft skills in geographically-separated healthcare students. This future research study opportunity would be timely and further extend this current study and its findings by weaving together both the student as well as instructor and standardized patient perspectives and experiences to appreciate the broader and deeper meanings and essences as a whole regarding this phenomenon.

A few examples of other potential future research studies that have been identified during the completion of this current study, include the following:

- The exploration of timing within the curricula specific to the development of professional socialization (PS) and IP socialization (IPS) and their impact on one another. Would an earlier emphasis of IPS prior to solidifying PS enhance or increase openness for

collaborative practice in healthcare? Does PS need to occur prior to IPS or can they occur concurrently?

- Is there a difference in meeting learning outcomes specific to soft skills and IP teamwork when delivered in a VW simulation versus a face-to-face simulation?
- Is there a difference in time to competency of IP teamwork skills between two varying modalities of simulation? Does a prior face-to-face simulation experience truly impact learning in a VW simulation?
- Does the use of combined, adjunct technologies such as virtual reality oculus rift goggles increase immersion and realism in a VW simulation for the purpose of practicing IP teamwork in healthcare students?
- Does the enhancement of realistic clinical skills and tasks make a difference in a VW setting for the purpose of practicing soft skills?
- What is the optimal number of simulations required in the curricula to achieve comfort with the VW technology as well as with IP teamwork competencies?
- How can constraints and limitations of VWs be mitigated through the use of alternative or supplemental online technologies for supporting teamwork practice in distance education?
- What is it like to practice emotional intelligence soft skills for distance learning healthcare students in a VW simulation?
- What is it like to practice collaboration as healthcare professionals within a VW simulation at the post-licensure level? How do employers perceive and support this type of learning for continuing education, quality assurance, and improvement purposes related to collaborative practice and patient-centered care?

- What is the cost-comparison of developing VW simulations versus face-to-face simulations in dedicated simulation centers in post-secondary healthcare education? Can VW simulations replace costly simulation centers for the purpose of soft skill development such as IP teamwork if there is no perceived significant difference between the two modalities by students in this study?

Possible Limitations of Study

One potential limitation in this study is the lack of multiple attempts or repeated VW simulations with the participants. Providing a "one-time" experience for each of the three cohorts may have resulted in a limited view and perspective of the phenomenon where multiple attempts and uses of the VW simulation may have provided new, or further insight and as a result, richer findings to better understand the overall essence of the participant experience in this phenomenological study.

Another limitation included the selection of pre-determined healthcare disciplines including nursing, paramedicine, respiratory therapy, and medicine. Random sampling, a broader selection of disciplines, or different sample group may have also contributed to a better understanding of what it is like to experience and practice IP teamwork within a synchronous VW simulation.

A third potential limitation of this study was the transcendental phenomenological approach itself. Although this methodology and associated procedures was effective in tackling the research questions in this study, perhaps an alternate approach may have gained different insights into this phenomenon. A case study approach may have been just as effective and simpler for the completion of this study. The sole use of thematic analysis may have also been

effective in identifying core themes that adequately described the participant experience with this phenomenon as a simpler approach for a novice researcher. The selection of transcendental phenomenology in and of itself became its own research study due to the complexity and need for learning of "a new language" and the related techniques and procedures. The significant time required to learn this methodology may have had a negative impact of potentially undermining the study itself and losing focus by becoming "sidetracked" and pouring a disproportionate amount of time into the learning, wrestling, and understanding of the various routes that phenomenology can take as a methodology in a research study. The examples above summarize the potential limitations in this study from the researchers' perspective.

Personal Growth and New Understanding

In a phenomenology-based qualitative study, the researcher is encouraged to "write a brief creative close that speaks to the essence of the study and its inspiration to you in terms of the values of the knowledge and future directions of your professional-personal life" (Moustakas, 1994, p. 184, as cited in Creswell, 2007).

The outcomes and implications at a personal level have been explored above and demonstrate new growth and understanding from the completion of this study. In addition to the description above, the researcher experienced other examples of personal growth throughout the journey of completing this study. An unforeseen area of personal growth for the researcher included an extended time of study and reflection on phenomenology itself as the selected method prior to applying the procedures to this current study. This extended time of reading and study of transcendental phenomenology was the result of grossly underestimating the complexities associated with the theoretical underpinnings and philosophy associated to this method. As a novice qualitative researcher at the graduate level, this may have been perceived as

a frustration, negative outcome, or delay in completing this current study and its associated requirements; however, with further reflection, it has become apparent that this extended time of reading and study has provided greater confidence and understanding for any potential future application and use of phenomenological procedures. Through my learning journey as a novice researcher, I have gained a much greater respect and appreciation for the importance of understanding the selected methodology in a proposed study prior to its application as well as a greater respect for the general structure, rigor, and complexity of qualitative research.

Completing the requirements of a graduate level thesis has been an invaluable experience. Exploring a research topic and question of personal interest and passion has assisted in persevering and enduring this challenge. Entering "uncharted waters" of qualitative research, phenomenology as a method, procedures of data collection in the form of focus groups and interviews, the coding and analyzing of data, the reporting of the findings, and positioning these results within the current body of knowledge specific to the phenomenon has been a rich and deep learning experience. As a result, I have changed as a person; my view on education, research, and the topic explored within this study have been altered, renewed, refreshed, and have become more clear. As a novice researcher, I must confess a newfound passion and interest in further expanding my knowledge, experience, and application of qualitative research in healthcare education, not only for the purposes set out in this study, but beyond.

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Appendix A: Observational Protocol

Total Time of Briefing, VW Simulation, and Debriefing Activity: Approx. 90 Min.	
Descriptive Notes	***Reflective Notes***

(Protocol adapted from Creswell (2007))

Appendix B: Focus Group Interview Protocol

Interview Protocol: Synchronous VW Simulation and IP Teamwork

Date and Time of Interview:

Place:

Interviewer:

Interviewee(s):

Thank the focus group participants for meeting with me and use a brief icebreaker question or statement prior to formal questions.

Questions:

1. What did you generally experience in this study in terms of learning and practicing IP teamwork in a synchronous VW?

2. What contexts or situations affected or impacted your experiences with this phenomenon?

3. How would you describe your experiences with synchronous communication(s) and any other technological elements in the VW environment?

4. What was your experience regarding student-student interaction, socialization, and perceived closeness to others in the VW simulation?

5. What is your experience regarding student-virtual environment interaction from an immersive and “sense of realism” perspective?

6. How would you describe the context or situation for learning and practicing IP teamwork?

7. How would you describe your experience specific to debriefing a simulation within a synchronous VW?

8. How has your attitude towards IP teamwork and other professions changed, if at all, following this experience?

Thank you for your participation and time.

(Adapted from Creswell, 2007)

Appendix C: Codebook

Code #	Label/theme	Definition/Brief Description
1	Learning from one another/Achievement of IP teamwork learning and practice	Evidence of IP teamwork learning and/or practice experiences in the VW sim. Any experiences that demonstrate achievement of IP teamwork learning and practice in the VW sim.
1.1	Negative aspects or effects on practicing/learning IP teamwork competencies/skills in a VW sim	Any evidence that describes negative experiences or a negative outcome/effects on developing sound IP teamwork skills in the VW sim. Any negative results on IP teamwork development due to the VW sim experience.
2	Context-based/Situational Learning/Experiential Learning	Any evidence related to a student sense of increased experience/experiential learning and exposure to IP teamwork in a patient care situation that could be applied or transferred to a future clinical situation.
3	Curricular integration considerations	Any experiences related to the integration of the VW sim and IP teamwork learning/practice within the curricula (i.e. timing, student selection, size of groups, formation of teams, familiarity of learners, level of learner, etc.).
3.1	Repetition/multiple attempts in curriculum desired.	Any experiences related to students desire for a second or repeated attempt and not just a "one-time" event in curriculum.
4	Face-to-face vs. VW simulations comparison	Any evidence of student experiences with comparing/contrasting VW sim with previous face-to-face sim experiences.
5	Training and Orientation to VW Technology	Evidence of participant experiences related to the orientation, training, and/or need for practice prior to participating in the VW sim for IP teamwork learning. Any issues related to student competency with use of VW technology.
5.1	Training on the concept of simulation	Any evidence pointing to the need for training on general simulation concepts as an instructional method (i.e. fiction contract, pros and cons of sim, etc.).
5.2	Training on VW platform and technology	Any evidence that describes student experiences with training related to the VW technology and interface/platform.
5.3	Training on IPE concepts and learner backgrounds.	Any experiences that are related to training and orientation to one another's roles, disciplines, and level of training prior to VW sim.

6	VW Technology Capabilities and Constraints for IP Teamwork Learning and Practice	Any participant experiences related to the VW platform and/or technology functionality (both positive and negative in nature) that had an impact on practicing/learning IP teamwork.
6.1	Cognitive overload in VW sim context	Any experiences that demonstrate a sense of cognitive overload for the student (complexity, distractions, and/or competing priorities or elements that limited IP teamwork practice and learning.
7	Verbal communication in VW sim.	Any experiences and issues with verbal communication when practicing/learning IP teamwork in VW sim.
8	Non-verbal communication in VW sim.	Any experiences and issues with non-verbal communication when practicing/learning IP teamwork in VW sim.
9	Impact on patient safety concepts and safe practice from VW sim.	Any experiences that demonstrate either a positive or negative outcome on patient safety from practicing/learning IP teamwork in the VW sim.
10	Impact of prior IPE or collaborative practice experiences.	Any evidence connected to previous IPE in curricula or previous collaborative practice experience in real clinical setting that may have had an impact on VW sim experience.
10.1	Comfort levels with IP teamwork	Any experiences that relate to student comfort levels with IP teamwork in general.
11	Socialization	Any experiences related to socialization, either before, during, or after the VW sim.
12	Realism/Authenticity of the IP teamwork experience in VW sim.	Any experiences related to issues of immersion, authenticity, and/or fidelity of the IP teamwork in the VW sim context.
13	DE student potential and opportunities	Any experiences that are related to the relevance, application, and transferability of the VW sim to the DE context for practicing/learning IP teamwork.
14	Physical attributes and presence of learner	Any experiences or issues related to the participants virtual physical characteristics and physical presence in the VW sim.
15	Fun, motivation, and openness/receptiveness of learning IP teamwork in VW sim context.	Any positive or negative experiences impacting the motivation, enjoyment, satisfaction, and openness for learning/practicing IP teamwork via the VW sim modality.

16	Emotional reactions toward others in the VW sim.	Any experiences that demonstrate an emotional reaction or positive/negative feelings toward another team member or character in the VW sim.
16.1	Perception of others/Judging of others in VW sim.	Any experiences that highlight evidence of participants judging one another or their perception of one another in the VW sim as IP team members.
16.2	Psychological safety for learning IP teamwork in VW sim	Any experiences from students that highlight their comfort levels with one another and degree of psychological safety to learn and participate in the VW sim.

Appendix D: Final Thematic Map with Abbreviated Formulated Meanings

Theme 1: Curricular Integration Considerations

1.1: An Experiential Learning Tool

- Observing other students perspectives in action results in better preparedness and transfer of VW sim to real future situations
- Learning with others at varying levels of training allows to perceive their future role on the team
- Closed an experiential learning gap and gained confidence
- Clinical learning and experience was achieved in addition to IP teamwork
- Unfamiliar clinical situations and environments experience
- Unfamiliar team members needing to work together under pressure promoted realistic IP teamwork development
- Decreased stress for future IP teamwork after VW sim experience
- Reduction of "first-time" patient and teamwork encounters with VW sim experiences
- Provides pre-determined clinical context exposures prior to clinical practicum
- Previous learning on IP teamwork "brought to life"
- Experience gained via VW sim prior to clinical practicum
- A safe, no-risk environment to practice at a slower pace
- Repetition of VW sim desired to further develop IP teamwork competency
- Curiosity if repeated VW sim would further improve, change, or progress IP teamwork skills

1.2: Face-to-Face vs. VW Simulations

- VW sim similar to previous face-to-face sim experiences
- Safe place to learn and feels just as close to others as face-to-face sim
- Novice learner feels more comfortable with VW sim compared to face-to-face sim
- VW sim a good initiation to IP teamwork practice with a focus of cognitive and affective domains of learning
- Face-to-face sim perceived to be more stressful
- VW sim allows time for processing and slower decision-making
- VW sim less realistic if student has previous face-to-face sim experience
- Face-to-face and VW sims should run concurrently to complement one another
- Learner engagement during debriefing the same in both face-to-face and VW sims
- "Time-in/Time-outs" in face-to-face sim could also be implemented in VW sim
- VW sim emphasizes soft skills and face-to-face sim has more emphasis on hard skills
- Less bias and judgment of one another in VW sim

- VW sim context can replicate face-to-face sim learning events that are focused on IP teamwork
- Debriefing is effective in VW sim but still preferred in face-to-face environment due to lack of non-verbal physical gestures

1.3: Prior Learning and Experience

- Great to work with other students at different levels of knowledge and experience as it replicates real life situations and promotes growth for everyone
- A positive tool for the novice learner for initiation to IP teamwork practice
- Greater benefit from VW sim for novice students with no previous exposure to IP teamwork
- Clinical context impacts learning and participation depending on level of learner
- Initial feeling of intimidation and inadequacy due to lower skill level but resolved by receiving support from other disciplines present on the IP team
- Prior face-to-face IPE learning and experience reinforced and affirmed by VW sim
- Diminished impact due to previous IP teamwork learning experience and "buy-in"
- Previous real IP teamwork experience limits or reduces impact of VW sim
- Previous real IP teamwork experience in the field increases comfort and confidence with VW sim

Theme 2: Orientation and Preparation Requirements

2.1: Orientation to One Another

- "Ice breakers", personal introductions, and team-building desirable for increased comfort levels prior to VW sim
- Need for greater awareness/briefing to each represented discipline on IP team prior to VW sim
- Current scope and level of training to date of each participant

2.2: Orientation to Simulation as an Instructional Method

- Frustration and confusion created in participant due to instructor role-play
- Awareness for the need of mentally filling the gaps of realism to assist with "buy-in" and "suspending disbelief"
- Limited face-to-face positioning with other avatars due to a mental disconnect between participant and the electronic-based scenario/game
- Scope of what you can and cannot do in VW sim

2.3: Training and Orientation to VW Interface

- Unfamiliar and unprepared feeling with VW interface despite initial group orientation

- Current orientation video and pre-reading insufficient, lacking experiential time in VW sim
- Incorporate a "dry run"/practice simulation in orientation prior to VW sim experience
- Decreased communication with team members due to lack of skill in use of avatar
- Minimal texting in VW sim due to feeling of too much going on
- A sense of competing priorities and multi-tasking
- Comfort levels decreased due to insufficient preparation time
- Cognitive overload with having to recall all of the interface features
- Flow and ease of use would improve with more familiarity of buttons
- Comprehensive and mandatory self-directed learning orientation recommended
- Microphone setup instructions and testing during orientation
- "Fussing with the computer" due to lack of comfort with interface, resulting in decreased focus and attention on unfolding clinical case

Theme 3:
VW Technology: Capabilities and Constraints for IP Teamwork Practice

3.1: Verbal and Non-Verbal Communication

3.1.a: Strengths and Opportunities

- Synchronous audio worked well
- Communication was effective and a valuable tool in accomplishing what needed to be done in VW sim
- Promoted realistic need for communication updates and listening skills when entering and leaving each space/room
- Promoted high-levels of closed loop communication because there was really only one person who could talk at a time
- Interaction and verbal communication between team members/patient supported realism and immersion, compensating for other less realistic features in VW
- Need for an enhanced visible marker or cue to indicate who is talking in the VW
- Live video chat software suggested by participant to see team members instead of avatars during debriefing
- Verbal communication preferred over text/chat feature in VW sim
- Perceived limitation of non-verbal communication promotes greater emphasis, need, and practice of closed-loop communication

3.1.b: Weaknesses and Limitations

- Avatar lacks sufficient amount of physical gestures and cues for non-verbal communication
- Inability to read emotions via facial expressions during debriefing
- Inability to practice non-verbal communication and observational skills-limited amount of communication skills that you can practice in VW

- Non-verbal communication is non-existent, changing how participants gather information, including overuse and dependency of verbal communication
- Uncertainty of who exactly is talking during delegation of tasks
- Slowed, hesitant verbal communication due to a lack of non-verbal cues
- Forced verbal communication due to lack of non-verbal gestures such as head-nodding resulting in unnecessary or excessive dialogue and talking over one another
- Difficulty speaking in subgroups or multiple conversations at the same time in the same room
- Difficult to all talk at the same time and still understand one another
- Difficult to judge when each participant will speak and fear of talking over each other
- Like a room of screaming kids due to lack of "side conversation" ability
- Communicating large amounts of verbal information in a timely manner difficult to do
- Fear of "stepping on someone's toe" and cutting them off during verbal communication resulting in paused and "slow motion" dialogue, not wanting to miss anyone's suggested action
- Microphone not dependable and cuts in and out due to sensitivity settings resulting in a breakdown of verbal communication
- Minimal use of texting feature due to cognitive overload and competing priorities such as moving avatars and clicking on menus
- Excessive verbal noise resulted in overuse of electronic medical record charting of vital signs/assessment findings and a negative behavior of no verbal communication of these pertinent findings to other team members

3.2: Realism and Authenticity of IP Teamwork in VW Sim

3.2.a: Physical Attributes and Presence

- Less bias and judging of one another as avatars compared to real face-to-face
- Avatar lacks sufficient amounts of non-verbal cues such as body positions and gestures
- Immersive and mimicked real life behaviors, normal interaction, and movements
- Intentional movement of avatar for physical presence when approaching patient
- Unable to read emotional responses via body language during debriefing
- Dr. Jones character/avatar triggers feelings of frustration and an emotional response in participants resulting in a "physical altercation" by blocking Dr. Jones
- Student felt surprisingly close and physically present to other team members
- Very aware of where others were in the room
- Participant faces other avatars when speaking to them
- Discipline-specific uniforms and distinct role-identity more important for recognition of team members than gender or similar physical attributes to the student
- Inability to mimic physical movements such as touching the patients arm
- More assertive, confident, and less hesitant to challenge authority as avatar compared to real life

- Ability to complete tasks from anywhere in the room during patient care with no requirement of correct body positioning and placement results in role confusion and unawareness of task completion
- Ease with physical movement of avatar and navigation inside the rooms
- Participants want to physically see one another's avatar during debriefing

3.2.b: Clinical Context…True to Life

- Lack of challenge and little to do specific to their discipline and role on the team
- More than one patient desired for greater complexity and challenge
- Conflict or perceived tension with staged actors in VW sim stimulated an emotional reaction in participants
- Participant senses rudeness by nursing assistant role-play staged actor
- Clinical learning occurred from complex clinical context despite superseding pre-requisite knowledge
- Felt just as real as a face-to-face sim
- Stimulation of all of the senses/high-fidelity is important for full immersion
- Live patient voice for interactive dialogue with patient preferred over menu selection of pre-determined questions/phrases
- Realistic clinical context with sufficient levels of complexity, conflict, and stress promotes learning and practice of IP teamwork

3.2.c: Clinical Skills and Tasks

- Lacks fidelity such as visual prompts when completing the steps in a clinical task/skill by simply clicking on menus
- Tactile stimulation such as video game controls desired for enhanced realism
- Additional time needed to figure out how to complete the required task and find the correct button
- Oversimplified and unrealistic clinical procedures/tasks results in error, promoting poor and unsafe IP teamwork clinical practice
- More emphasis on actual tasks desired although participants recognize the purpose and focus of soft skills practice
- Ability to complete clinical tasks from anywhere in the room without proper positioning requirements for task completion resulting in unrealistic task completion and role confusion on team

3.3: Other VW Technology and Interface Experiences

- Difficult to read and confirm the vital signs on the small patient monitor
- Lung sounds difficult to hear due to competing noises and voices
- Need for ability to zoom/enlarge images such as the ECG
- Pop-up window with learning objectives blocks view of participants during debriefing
- Distracting and irrelevant automated avatar at nursing station while attempting to retrieve medications

- Awkward menu selection resulting in inefficient assessment of patient
- Medication requisition too simplistic and should allow student to choose any drug, dose, and route as opposed to selection of pre-determined drugs and doses

Theme 4:
Achievement of Positive IP Teamwork Learning and Practice

4.1: IP Socialization

- Strong emotional response (hates Dr. Jones and thinks he is a jerk) toward role-play staged actor
- Less bias, judgment, and stereotyping in VW sim
- Builds rapport, trust, and closeness
- Sufficient level of closeness formed to interact as an IP team without prior face-to-face introductions
- No perceived tension among team members and good communication despite never meeting one another
- Got to know one another a bit better
- Potential for "reaching the masses" for getting to know and interact with one another
- Ability to be honest during debriefing discussions
- Verbal communication obstacles mitigated by limiting group size
- A good opportunity for students of various disciplines that might not normally work together or meet one another prior to graduation

4.2: A Safe and Motivating Place to Practice IP Teamwork

- A positive supplemental learning tool for remote and distance learning students
- Different people in different places meeting together at the same time perceived to be "cool" and desirable
- Anxiety and nerves in VW sim mitigated by mutual feedback and debriefing experience
- A psychologically safe place to learn
- No fear of rejection or humiliation from others if unsure what to do
- Welcomes feedback and able to ask for help when needed
- Excellent asset for building teamwork and communication skills without hurting feelings of others
- Ability and willingness to learn from mistakes with one another
- Feedback from patient and team members a great learning experience
- Encouraging and inspiring from perceived support by team members
- Enhanced awareness of participants own need for IP teamwork training
- Great that this can be experienced and practiced remotely
- Potential self-assessment tool to see how well you perform on an unfamiliar IP team

- Fun use of avatars that can look like the participant, although not required
- Desire to repeat the VW sim and see it again in the near future
- VW sim a good environment for practicing soft skills, not clinical tasks

4.3: Evidence of IP Teamwork Learning and Skill Development

- Mutual feedback
- Assertiveness with delegation
- Increased role awareness and clarity, as well as similarities and differences in scope of practice
- Patient safety promotion
- Awareness of potential conflict and conflict resolution
- Accountability and challenging of others in a professional manner including those in authority (hierarchy) for patient safety
- Leadership
- Communication and listening, including closed-loop communication
- Situational awareness updates upon entering or leaving each room/space
- Expertise access and finding clinical support on the team
- Attitude change toward others resulting in increased respect, appreciation, and patience
- Work efficiencies in hospital identified
- Knowing your environment
- Collaborative practice when making clinical decisions together via mutual feedback resulting in enhanced patient care
- Self-awareness and self-management during an emotional response toward other IP team members
- Not speaking when you should, recognizing potential high-risk situation due to lack of communication
- Heightened confidence to challenge and confront others on team in VW context compared to a real situation

Appendix E: Simulation Scenario Overview and IP Teamwork Rubric

The simulation scenario in the VW will be a clinical situation where an IP healthcare team will need to work together to care for a "real" patient. The patient will be suffering from an acute myocardial infarction (heart attack) and require further care and transport to another healthcare facility. The key competencies in Appendix F will drive the scenario objectives and development of this simulation and its context.

An observation/assessment checklist was utilized for the instructor participant in the VW simulation to assist in assessing IP teamwork competencies and to record observations during the activity to be used for feedback and debriefing purposes following the simulation. An existing Observer Teamwork Rating Scale was also used with permission from the author for this purpose (Wright, 2002). The dimensions of teamwork behaviors in this scale include 1) assertiveness, 2) decision-making, 3) situation assessment, 4) leadership, and 5) communication.

Appendix F: IP Teamwork Competencies

The Canadian Patient Safety Institute (www.patientsafetyinstitute.ca) safety competencies will be used to guide the teaching, scenario design, and practice of these skills in the VW simulation.

Domain Two: Work in Teams for Patient Safety

Healthcare professionals are able to:

1. Participate effectively and appropriately in an IP healthcare team to optimize patient safety
2. Meaningfully engage patients as the central participants in their healthcare teams
3. Appropriately share authority, leadership, and decision-making
4. Work effectively with other healthcare professionals to manage IP conflict

Domain Three: Communicate Effectively for Patient Safety

1. Demonstrate effective verbal (and non-verbal) communication abilities to prevent adverse events
2. Communicate effectively in special high-risk situations to ensure the safety of patients
3. Use effective written communications for patient safety (optional)
4. Apply communication technologies appropriately (not applicable)

Appendix G: Information/Invitation Letter

Email Title: *VW Simulations for IP Teamwork-Research Opportunity*

To: Prospective healthcare student research participant

Research Title: VW Simulations for IP Teamwork Practice in Healthcare Education.

Contact Information

Principal Investigator: Norbert Werner, Athabasca University (AU) Graduate Student.

Contact information: 780-378-5368 or email at norbertw@nait.ca.

AU Research Ethics Board (REB) Review and Additional Contact Information

This study has been reviewed by the Athabasca University Research Ethics Board. Should you have any comments or concerns regarding this proposed research or your treatment as a participant in this study, please contact the Office of Research Ethics at 1-780-675-6718 or by e-mail to rebsec@athabascau.ca. You may also contact Dr. Tom Jones who is the supervisor of this research study at tomj@athabascau.ca or at 1-866-514-6233. The University of Alberta REB Office at (780) 492-2615, as well as NAIT REB Office at (780) 378-5185, are additional points of contact if you have concerns about this study.

Invitation

I would like to invite you to be a participant in this proposed research study. As the researcher, I would like to better understand and explore the student perspective and the overall essence of their experiences with VW simulations as an instructional method for teaching and practicing IP teamwork among healthcare students. You have been selected as a prospective student participant because you are either a senior student, nearing completion of your program or have recently graduated from your program (within three months).

Description of Research

The purpose of this qualitative study is to explore and discover the overall essence of the student participant experience in IP teamwork within a synchronous VW simulation for healthcare students. Student participants will be recruited from two post-secondary institutions in Edmonton, Alberta and the actual research will be conducted at one of these campuses in Edmonton. At this stage in the research, IP teamwork and synchronous VW simulation will be generally defined as the following:

- *IP teamwork*: Interdisciplinary healthcare students (representing different health professions) working together in an integrated and interdependent manner, sharing a team identity with the goal of solving problems and delivering services (Reeves et al., 2010).
- *Synchronous VW simulation:* An avatar-based 3D VW desktop simulation where IP healthcare students will meet together at the same time (synchronous) to experience and care for a simulated patient within a realistic environment that replicates a real-world healthcare situation.

Data will be collected in the form of face-to-face focus groups at this Edmonton campus site, face-to-face or telephone follow up interviews with individual participants (as needed), and review of recordings of the VW simulation and transcripts from the interviews. You will be part of the focus group interview immediately following your experiences with the VW simulation and you may be invited to further participate in a one-on-one interview. If selected for an interview, participation will be completely voluntary and the data and status of all participants and non-participants will be kept anonymous and confidential.

Your role as a prospective participant is to complete 1) a brief pre-reading (optional) of content specific to IP teamwork in healthcare, 2) complete a brief orientation to the VW software, 3) participate in the actual VW simulation with three other students, each of you representing a different discipline, 4) participate in a post-simulation debriefing, 5) participate in the focus group interview(s), and 6) potentially participate in a follow-up individual interview (only if needed). You may also be approached for a follow up meeting via face-to-face or telephone to discuss preliminary data analysis findings to ensure accuracy and for further input.

The total time requirement of the study will be approximately 2-2.5 hours (not including travel time to host institution site).

Risks and Benefits

This research study is considered to be a low-risk study as no associated risks have been identified at this time. Interaction within the VW simulation will require the same psychomotor skills that are required for everyday computer use. The benefits in participating in this study include gaining experience with qualitative research, learning more about IP education and teamwork as a healthcare student and professional, and experiencing a VW simulation at no cost to you. Future healthcare students and faculty will also benefit from this research by providing rich feedback, student participant insight, and enhanced application of VW simulations as a learning technology used in distance education and/or geographically separated learners. Society as a whole may also benefit from this research as IP teamwork in healthcare and patient care are further enhanced via VW simulation technology. The researcher will benefit from this study by enhancing his understanding of the overall essence of the learner experience with VW simulations for IP teamwork practice in healthcare education and by receiving credit toward the Master of Distance Education degree at Athabasca University.

All participants will be provided with free parking or reimbursed for parking expenses with proof of payment. Bus fare will also be reimbursed if the student choses to use public transportation upon presentation of receipts (taxi fares are not included).Participants will also be offered a nominal honorarium (e.g. $10.00) after the completion of the focus group interview in the form of a gift card to cover any other unforeseen costs. Light refreshments (water/juice/snack) will be provided. No full meals are included. The expenses (mentioned above) will be covered regardless if the participant withdraws part way through or completes all phases of the study; however, the honorarium will only be provided to participants who complete the focus group portion of the data collection.

Right to Refuse and Freedom to Withdraw

The purpose of this invitation letter and associated consent form is to provide you with information regarding this study and to assist you in making an informed decision whether to participate in this research**.** You have no obligation to participate in this study and should not feel pressured to do so at any time by anyone. You may withdraw from the study at any time without consequence. If you wish to withdraw from the study, your information will be removed from the results *upon your request*. Your permission will be sought to include what has been contributed up to the point of withdrawal. Data will not be able to be withdrawn once data analysis has been completed in the study. Withdrawal from the study will not affect your relationship with the researcher and/or your current role as a student in your institution. Please contact the researcher if you wish to withdraw.You may also refuse to answer any of the questions during the focus group interviews should you decide to participate in this study.

Privacy, Confidentiality and Anonymity

All personal identifiers will be stripped from datasets and recoded to enable analysis. Any personal identifiers that are retained within raw data will be securely stored in order to protect the participants and their contributions as well as to facilitate further contact for any follow up interviews. The materials to be archived include the transcripts (paper and electronic) from all focus group and individual follow up interviews as well as any audio recording from these interviews. Any recording of the VW simulation audio and text will also be securely archived with all other data. Archived raw data will be saved for a minimum of five years as per institutional policy and for possible future research opportunities. After that time, all raw data will be destroyed. Paper-based raw data will be shredded and digital raw data files associated to the research will be completely and permanently erased from computer hard drive(s) by the researcher. Data will be stored and archived securely in the researchers' office within a locked desk as well as electronically in a secure drive on the network with encrypted password protection. Identifiable participant information from initial recruitment and data collection will be retained as part of the archive so that future contact might be re-initiated in the event of possible future use and for any continued follow up with participants (as mentioned above). The identifiable information will only be accessible and securely stored by the principal investigator. The researcher will be the only person who has access to the data at any time. If any further use of the data is required for future research, the researcher will request further consent from you at that time via a formal ethics approval process.

Freedom of Information: All research participants will be advised that the information they provide and any other information gathered for the research project will be protected and used in compliance with Alberta's Freedom of Information and Protection of Privacy Act.

Results of the study

The results of the study will be reported in a narrative form, reporting the overall essence of the student participant experiences with synchronous VW simulations for practicing IP teamwork as healthcare students. The draft version of the narrative will be shared with the participants for validation purposes prior to final completion of the report. The results may be published in a

journal and shared with the rest of the research community. The existence of the research will also be listed in an abstract posted online at the Athabasca University Library's Digital Thesis and Project Room and the final research paper will be publicly available.

Thank you for taking the time to read this information letter regarding this proposed research study. If you would like to participate in this study, please review and sign the provided *Participant Informed Consent Form(s)* included with this letter of invitation.

Sincerely,

Norbert Werner
Principal Investigator
AU Graduate Student

Appendix H: Participant Informed Consent Form-Focus Group

Title of Project: VW Simulations for IP Teamwork Practice in Healthcare Education.

Principal Investigator: Norbert Werner, Athabasca University (AU) Graduate Student.

Contact Information: 780-378-5368 or email at norbertw@nait.ca.

Supervisor: Dr. Tom Jones at tomj@athabascau.ca or at 1-866-514-6233.

Do you understand that you have been asked to be in a research study?

Yes No

Have you read and received a copy of the attached information/invitation letter?

Yes No

Do you understand the benefits and risks involved in taking part in this research study?

Yes No

Have you had an opportunity to ask questions and discuss this study?

Yes No

Do you understand that you are free to refuse to participate, or to withdraw from the study at any time, without consequence, and that your information will be withdrawn at your request?

Yes No

Has the issue of confidentiality been explained to you? Do you understand who will have access to your information?

Yes No

This study was explained to me by: Norbert Werner, Principal Investigator **Yes No**

I agree to take part in this study:

_____ _____ _____

Signature of Research Participant **Date** **Witness**

_____ _____

Printed Name **Printed Name**

I believe that the person signing this form understands what is involved in the study and voluntarily agrees to participate.

_____ _____

Signature of Investigator or Designee **Date**

Appendix I: Participant Informed Consent Form-*Individual Interviews*

Title of Project: VW Simulations for IP Teamwork Practice in Healthcare Education.
Principal Investigator: Norbert Werner, Athabasca University (AU) Graduate Student.
Contact Information: 780-378-5368 or email at norbertw@nait.ca.
Supervisor: Dr. Tom Jones at tomj@athabascau.ca or at 1-866-514-6233.

Do you understand that you have been asked to be in a research study?
Yes No

Have you read and received a copy of the attached information/invitation letter?
Yes No

Do you understand the benefits and risks involved in taking part in this research study?
Yes No

Have you had an opportunity to ask questions and discuss this study?
Yes No

Do you understand that you are free to refuse to participate, or to withdraw from the study at any time, without consequence, and that your information will be withdrawn at your request?
Yes No

Has the issue of confidentiality been explained to you? Do you understand who will have access to your information?
Yes No

Are you willing to participate in a follow up individual interview via telephone or in person for further data collection if needed?
Yes No

This study was explained to me by: Norbert Werner, Principal Investigator Yes No

I agree to take part in this study:

_____ _____ _____
Signature of Research Participant **Date** **Witness**

_____ _____
Printed Name **Printed Name**

I believe that the person signing this form understands what is involved in the study and voluntarily agrees to participate.

_____ _____
Signature of Investigator or Designee **Date**

Appendix J: Copies of Three Research Ethic Board (REB) Letters of Approval

<See next three pages>

MEMORANDUM

DATE: June 12, 2013

TO: Norbert Werner

COPY: Dr. Tom Jones (Research Supervisor)

Alice Tieulié, Recording Secretary, Research Ethics Board

Dr. Simon Nuttgens, Chair, AU Research Ethics Board

FROM: Dr. Vive Kumar, Acting Chair, Research Ethics Board

SUBJECT: **Ethics Proposal #13-09** ***"Virtual World Simulations for Interprofessional Teamwork Practice in Healthcare Education"***

Thank you for your June 12th resubmitted application arising from the Research Ethics Board's "Full Approval" decision of May 22, 2013. Your cooperation in revising and furnishing additional information requested was greatly appreciated.

On behalf of the Athabasca University Research Ethics Board, I am pleased to confirm that this project has been granted **FULL APPROVAL** on ethical grounds, and you may proceed with participant contact.

Approval for this study "as presented" is **valid for a period of 12 months** from the date of this memo (**to June 12, 2014).** If required, an extension must be sought in writing prior to the expiry of the existing approval.

A Final Progress Report (form) is to be submitted when the research project is completed. Reporting forms are available online at http://www.athabascau.ca/research/ethics/.

As you progress with implementation of the proposal, if you need to make any changes or modifications please forward this information to the Research Ethics Board as soon as possible. If you have any questions, please do not hesitate to contact rebsec@athabascau.ca

If you have any questions, please do not hesitate to contact the research ethics administrator at rebsec@athabascau.ca .

The Northern Alberta Institute of Technology

Research Ethics Board

Certificate of Ethics Approval for Research Proposal

Principle Investigator: Norbert Werner

Co-Investigator(s) / Supervisor: Tom Jones

Organization(s): NAIT

Project Title: Virtual World Simulations for Interprofessional Teamwork Practice in Healthcare Education

Grant/Contract Agency: NAIT

Research Ethics Application #: 2013-19

Research Ethics Approval Expiry Date: June 25, 2014

Certification of the Northern Alberta Institute of Technology Research Ethics Approval

I have received your application for research ethics review and conclude that your proposed research meets the Northern Alberta Institute of Technology Policy for research involving human subjects (IR 10.0). On behalf of the Northern Alberta Institute of Technology's Research Ethics Board (NAIT REB), I am providing research ethics approval for your proposed project.

This research ethics approval is valid for one year. To request a renewals after (today's date + 1 year) please contact me and explain the circumstances, making reference to the research ethics review number assigned to this projects (see above). Also, if there are significant changes to the project that need to be reviewed, or if any adverse effects to human participants are encountered in your research, please contact me immediately.

Chair, Research Ethics Board

Printed Name: Dr. Melissa Dobson **Signature:** 

Date: June 25, 2013

Notification of Approval

Date:	July 30, 2013
Study ID:	Pro00040948
Principal Investigator:	Norbert Werner
Study Title:	*Synchronous 3D Virtual World Simulations for Interprofessional Teamwork Practice in Healthcare Education.*
Approval Expiry Date:	July 29, 2014

Approved Consent Form:	Approval Date	Approved Document
	30/07/2013	Invitation-Information Letter.docx
	30/07/2013	Informed Consent Form-Individual Interviews.docx
	30/07/2013	Participant Informed Consent Form.docx

Thank you for submitting the above study to the Research Ethics Board 1. Your application has been reviewed and approved on behalf of the committee.

A renewal report must be submitted next year prior to the expiry of this approval if your study still requires ethics approval. If you do not renew on or before the renewal expiry date, you will have to re-submit an ethics application.

Approval by the Research Ethics Board does not encompass authorization to access the staff, students, facilities or resources of local institutions for the purposes of the research.

Sincerely,

Dr. William Dunn

Chair, Research Ethics Board 1

Note: This correspondence includes an electronic signature (validation and approval via an online system).